

**Best
Management
Practices
to Control**

Nonpoint Source Pollution

**A Guide for Citizens
and Town Officials**

January 2004



Best Management Practices to Control Nonpoint Source Pollution

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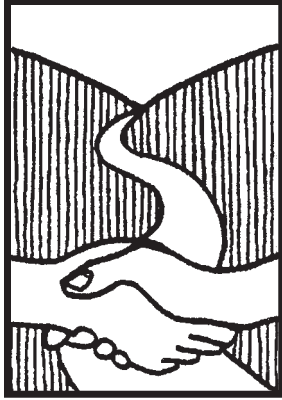
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Best Management Practices to Control

Nonpoint Source Pollution

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INTRODUCTION

Residents and visitors alike will attest that New Hampshire's waters are an ideal place to swim, fish, and sail. Many people feel strongly that future generations should also have access to clean water. However, all freshwater lakes, rivers, and streams in New Hampshire are currently listed as "impaired" because of a fish consumption advisory for mercury contamination. Additionally, the state has 10,505 acres of lakes and 1,178 miles of rivers classified as threatened or impaired by other pollution sources. Fortunately, this is a small percentage of lakes and rivers in New Hampshire. Although there have been great advances in reducing pollution from industrial discharges and sewage treatment plants in the last 25 years, according to the EPA about half the water quality problems nationwide now are associated with nonpoint source pollution. Polluted runoff from

the land is called nonpoint source (NPS) pollution. It occurs when rain or snowmelt flows over land as runoff, or through the ground as groundwater, picks up pollutants, and eventually discharges to a body of water.

Urban and suburban land uses, construction, forestry, septic systems, recreational boating, agriculture, and physical changes to stream channels are potential sources of NPS pollution. NPS pollution is widespread and we all contribute to it by driving a car, applying fertilizer to a lawn, converting land for a new home

or business, and sometimes even taking a pet for a walk.

The purpose of this guide is to describe the causes of NPS pollution and to suggest ways that NPS pollution can be prevented or at least reduced. Best management practices (BMPs), which are land treatment or operational techniques used to prevent or reduce pollution, are listed along with references for more information. **Section 1** provides background information on water resources and how they can be impacted by NPS pollution. **Section 2** describes water resource impacts from existing and new development, provides suggested BMPs, references applicable laws and regulations, and lists additional resources. **Section 3** describes specific land use activities that could affect water resources, provides suggested BMPs, references applicable laws and regulations, and lists additional resources. **Section 4** describes how to get involved in local watershed organizations and volunteer water monitoring



What is a BMP?

There are multiple terms associated with the control of non-point source pollution. This document uses the term BMPs, which are individual practices that serve specific functions.

BMPs can be structural, such as a fence for excluding livestock or a buffer strip to reduce sediment in runoff, or non-structural such as street sweeping.

BMPs are designed to reduce the pollutants that are generated at and/or delivered from a source to a water body.

It is important to acknowledge that the term “best” is highly subjective and the appropriateness of certain practices

may vary regionally or depending on land use.

BMPs, in general, control the delivery of NPS pollutants to water bodies in the following three ways:

- source reduction by minimizing pollutants available in the first place;
- retarding the transport of pollutants by reducing water transported or by retaining pollutants; and
- remediating or intercepting the pollutants before or after they are delivered to the water resource by chemical or biological transformation. ■

activities. Funding opportunities for efforts to reduce NPS pollution are listed in **Section 5**. Finally, the appendix lists contact information for agencies referenced in this guide.

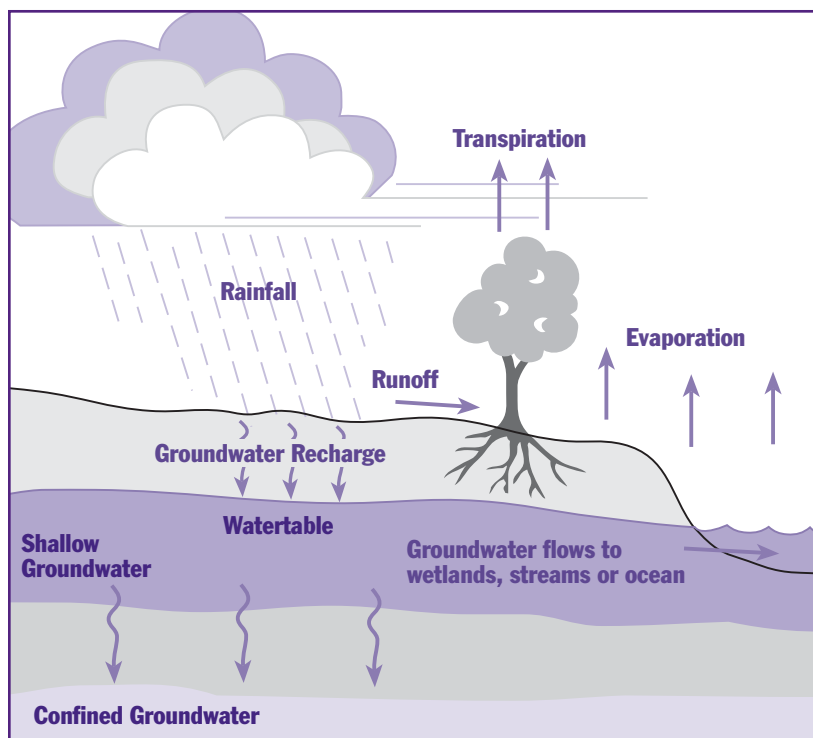
The New Hampshire Department of Environmental Services (DES) is working to reduce non-point source pollution in New Hampshire in several ways. Many of our efforts are linked to the *New Hampshire Nonpoint Source Management Plan*, which was developed in October, 1999 and is available online at www.des.nh.gov/wmb/npsplan.pdf. This plan contains a five-year action plan and lists NPS types in order of priority. Anyone with further questions should contact the DES Watershed Assistance Section at (603) 271-2457. Many of the DES references listed in this guide can be accessed on our website at www.des.nh.gov.



Water Cycle and Pollution

Water in oceans, lakes, ponds, rivers, streams, wetlands, groundwater, ice sheets, and the atmosphere are all linked by the hydrologic cycle, the movement of water from one system to another. The atmosphere holds large quantities of water vapor, which falls as rain or snow. This precipitation falls directly into surface water bodies (such as a lake or river) or onto land surfaces, where much of it seeps into the ground and eventually becomes groundwater. Lakes, streams, and wetlands are formed where the slowly moving groundwater intercepts the ground surface. In fact, about 50 percent of the water in New England streams is groundwater discharge. Eventually, all of this water finds its way back to the ocean, where it will evaporate into the atmosphere, become rain or snow, and continue through the cycle.

The term “water pollution” often evokes an image of large pipes delivering unsightly wastewater from factories into rivers and streams. Public awareness of this problem and strict federal laws enacted during the past 30 years have made it rare today to find such obvious examples of water pollution. Yet water pollution remains a problem, due in part to nonpoint source pollu-



tion. Pollutants follow the paths water takes in the hydrologic cycle and affect the quality of our waterbodies. For example, pollutants from septic systems may impact the same groundwater that is tapped for water supply wells, or pollutants may move with the groundwater before discharging into a stream. Oil leaking from cars is carried with surface runoff from parking lots and is discharged into streams. Sulfur dioxide and nitrogen oxides emitted into the air from power plants and combustion engines are converted in the atmosphere to sulfuric acid and nitric acid and are deposited on

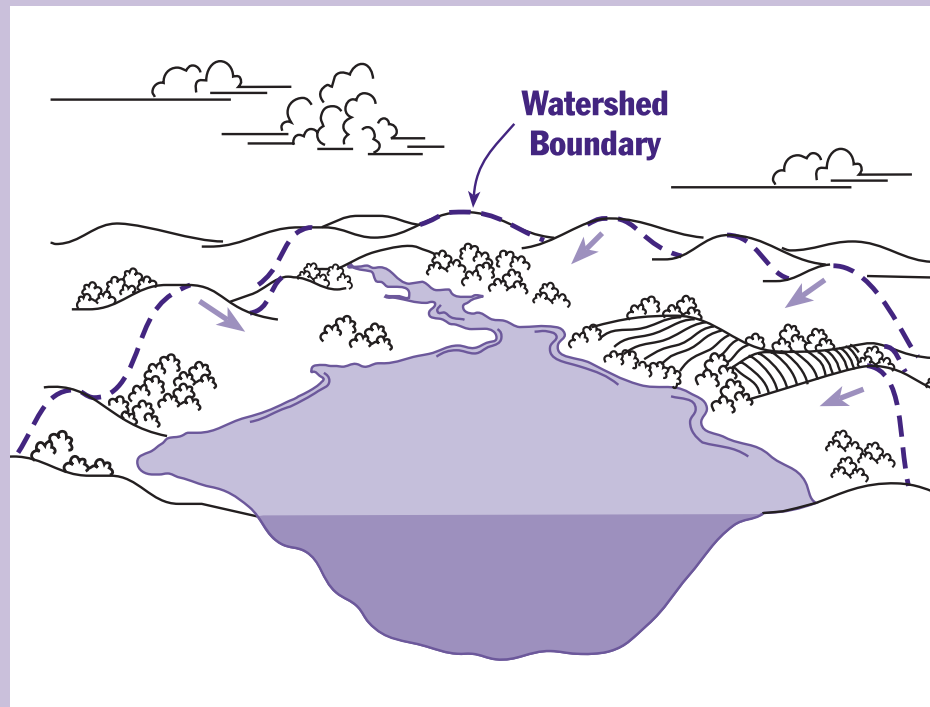
the earth with precipitation. This acid deposition can cause several ecological problems, such as fish deaths. Similarly, tiny amounts of mercury enter our atmosphere from sources such as incinerators and power plants; the mercury attaches to rain drops and dry particles and follows the pathways of the water cycle. Mercury concentrations increase up the food chain from water to plankton to fish and to animals that eat fish. High concentrations of mercury in fish have caused many states, including New Hampshire and all New England states, to issue health warnings about freshwater fish consumption.

The Watershed Approach

A watershed is defined as the geographic area in which all water running off the land drains to a given stream, lake, wetland, or other waterbody. A watershed can be thought of as a funnel with the waterbody at the bottom of the funnel and the high points, such as mountains, at the top. The

size of the drainage area can be as small as your backyard or as large as several thousand square miles. Nonpoint source problems can originate anywhere in a watershed.

There are five major watersheds in New Hampshire; these include the Coastal/Piscataqua River, the Merrimack River, the Connecticut River, the Saco River, and the Androscoggin River. These five watersheds are made up, in turn, of many smaller watersheds defined by



each of the rivers, lakes, ponds, and streams that feed into the bigger rivers. It is most effective and easiest to work in the smallest watershed unit possible when addressing water quality problems.

Tackling water quality issues using a watershed perspective makes a lot of sense because water quality problems often result from a number of smaller sources that cumulatively have a measurable, negative impact on receiving

waters. Moreover, good water quality is best protected by managing land use practices in the watershed. The challenge of using a watershed approach to manage water quality, however, is that watershed boundaries do not typically follow town, state, or international borders. Organizations and citizens within a watershed must often come together from across municipal boundaries to design creative management solutions. ■

Another form of nonpoint source pollution is hydrologic modification. This term refers to activities that affect the natural pathways of surface water, such as stream channel modification and channelization, dam construction and operation, and streambank and shoreline erosion. Although these activities don't seem like

forms of pollution, they nevertheless are considered to be part of the NPS pollution problem. Many rivers and streams have natural flood control areas, such as oxbows, adjacent wetlands, and riparian zones. When these areas are modified or removed, significant changes in the ecological functions of surrounding lands are

likely to occur. Channel modifications frequently degrade instream and riparian habitat for fish and wildlife. Other impacts include erosion and the reduction of the system's ability to filter pollutants. Similarly, increased development around the perimeters of lakes and ponds can change surface hydrology and reduce natural buffers.

Lakes and Ponds

Over one thousand lakes and ponds are scattered across New Hampshire's scenic and diverse landscape. Many of these beautiful waterbodies are a result of glaciation that took place 10,000 years ago and earlier. As glaciers advanced and then receded, they carved pockets into the earth's surface, and these filled with water as the glaciers melted. Limnologists distinguish between a lake and a pond roughly by their depth—a pond allows sunlight to penetrate down to the bottom, and a lake is deep enough to filter out the sunlight from at least a portion of its bottom. When it comes to naming bodies of water in New Hampshire, though, there is no official distinction between a lake and a pond. New Hampshire legally designates all natural lakes and ponds that are equal to or greater than 10 acres as “public waters of the State” or “great ponds.”

Water moves relatively slowly through lakes and ponds. This allows time for aquatic plants, such as algae, to use nutrients for growth. It also allows time for decaying animal and plant materials to settle to the lake bottom. Streams bring in sediment that add to the debris accumulating at the bottom. Lakes eventually fill in through this natural aging process called *eutrophication*. The characteristics of a eutrophic lake are an abundance of aquatic plants, nutrient-rich water, and a

shallow, mucky bottom. Although eutrophication is natural, fertilizers, eroded soil, and failed septic systems accelerate the process. Phosphorus is the limiting nutrient for New Hampshire lakes and ponds. This means that the concentration of phosphorus is the primary determinant of lake productivity. The potential for algae blooms and reduced water clarity increases as more phosphorus enters a lake. Lakes respond differently to nutrient loading, depending on the physical characteristics of the lake. Excessive weed growth can be a nuisance for swimming and boating; decay of these weeds by micro-organisms can use up oxygen in the lake and make it uninhabitable for fish and other aquatic animals. To reduce the phosphorus loading, shoreland owners are encouraged to main-

tain or restore the vegetation along the shore. Similar management techniques are recommended for upland areas in the lake watershed.

Exotic aquatic plants such as milfoil and fanwort are also a problem in New Hampshire lakes and ponds. These plants flourish because they have no established relationships with native predators or competitors that would keep their growth in check. When these exotic plants grow without natural controls, they encroach into and replace the habitats of native plants, thereby disrupting the food chain, stunting fish growth, and degrading wildlife habitat. Several exotic weeds thrive in disturbed areas and sometimes the growth of exotic plants is exacerbated by nutrient loading from NPS pollutants.



Rivers and Streams

There are almost 10,000 miles of rivers and streams in New Hampshire. When one considers rivers and streams as pollutant carriers, often times the phrase “dilution is the solution to pollution” is mentioned. To a marginal degree this is true, because rivers are good at assimilating treated discharges from wastewater treatment facilities. But, you only have to look back 20 years to remember what can happen to a river or stream if its diluting capacity is overloaded with pollutants.

As we have studied the dynamic nature of rivers, we have learned that there are several sources of nonpoint source pollution that commonly occur and negatively

affect water quality and habitat (these pollution sources can also affect other types of waterbodies). In New Hampshire the biggest sources include:

- urban runoff, particularly in the southern part of the state where there are more urban centers and in areas where large shopping centers, malls, or parking lots are located near rivers;
- failed septic systems near rivers and streams;
- poorly planned and managed construction sites where activities cause erosion and sedimentation;
- changes to stream flows, groundwater recharge,



and runoff patterns after development; and

- agricultural runoff

With better management practices for these and other non-point source pollution problems we can continue to protect our rivers and streams for recreation, aesthetic beauty, wildlife habitat, water supply, and other purposes.

Wetlands

Wetlands is a collective term for areas that are transition zones between aquatic and terrestrial



areas. They include areas such as bogs and fens (peatlands), freshwater marshes, salt marshes, wooded

swamps, and riparian areas. Some receive and produce surface drainage, while others simply catch and absorb precipitation. Wetlands provide critical habitat for many kinds of plants and animals, contribute to the aesthetic beauty of the landscape, and provide many recreational and educational opportunities. They also perform many beneficial functions from a pollution control standpoint. Some wetlands function as flood storage reservoirs, holding and slowly releasing excess storm runoff, thus preventing downstream flooding and erosion. Wetlands also trap eroded sediment by slowing down

the flow of water and allowing the sediment particles, which often have other pollutants attached to them, to settle out of the water. The dense vegetation in wetlands helps filter out excess nutrients dissolved in the water, thus reducing eutrophication problems in other waterbodies. Some wetlands act as seasonal groundwater recharge areas, which stabilize stream flow rates and the drinking water supplies of towns reliant on groundwater. The protection of wetlands, and the relatively inexpensive yet highly effective pollution control functions they provide, is critical to the protection of water quality.

Estuaries are coastal areas where there is at least one opening to the ocean, making for a mix of fresh and salt water. In and around these embayments are many kinds of habitats including mud flats, beds of submerged aquatic vegetation (e.g., eelgrass beds), and open water. In addition, many estuaries are flanked by salt marshes and/or rocky intertidal areas. The influx of ocean water combined with nutrient-rich river runoff from inland areas helps create diverse habitats that are home to a myriad of plants, animals, birds, and fish. In fact, approximately two-thirds of the commercially harvested fish and shellfish (including clams, mussels, oysters, and scallops) live in estuaries for part or all of their lives. The scenic views and protected

waters of estuarine areas are appealing to people and make them prime areas for development. The adverse effects of shoreline alteration, chemicals and sewage from boats and shorefront homes, and the polluted runoff from intensely developed inland areas degrade

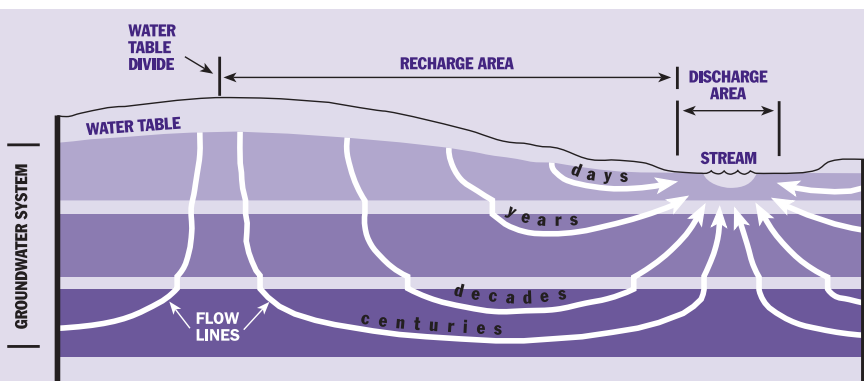
estuarine water quality, especially in estuaries with poor tidal flushing. Loss of habitat, closure of shellfish beds, and degradation of water quality all point to the need to wisely manage and guide the development around estuaries as well as the inland areas that influence them.



Groundwater is defined as water that completely fills the spaces between soil and rock particles underground. Many of us

get our drinking water from groundwater. In general, groundwater is vulnerable to pollution because surface contamination

can infiltrate directly into it. Groundwater pollution has resulted from human use, storage, handling, and disposal of contaminants including unlined landfills, underground fuel storage tanks, and septic systems. Proper management of human activities can prevent groundwater contamination in the future, but prevention is challenging because land associated with public water supplies is, on average, four times as developed as the rest of New Hampshire.





2 BEST MANAGEMENT PRACTICES FOR DEVELOPED OR DEVELOPING LAND

This section discusses water quality issues related to previously-developed areas and developing areas, and offers management practices to reduce nonpoint source pollution for both types of areas.

The rural character of New Hampshire is something many people cherish and wish to preserve. Nevertheless, it is obvious that the state is undergoing development and growth, particularly in the southern part and the Seacoast region. Between 1990 and 2000, the population of New Hampshire increased by 11.4 percent, which made it the fastest growing state in New England. Vacation homes comprised 10 percent of the residential units in the state in 2000, and as the regional and national population

increases, the interest in New Hampshire as a place to have a second home will likely continue to grow. New Hampshire will have to accommodate new residents and vacationers with more houses, office buildings, shopping centers, schools, and roads. As land is converted from forests or farm fields to a house, road, or parking lot, there are inevitable effects on water quality and quantity.

New residential, commercial and industrial development can increase NPS pollution for many reasons, including the greater use

of chemicals on developed land (e.g., fertilizer, pesticides, oil, detergents), the greater potential for erosion due to the disturbance and use of the site, and the increase in impervious cover, which results in more runoff. In addition, development often reduces the amount of vegetated areas that buffer the impact of the increased runoff and higher pollution levels.

Development can also impact the movement of water or hydrologic functions of a watershed. Such impacts can include

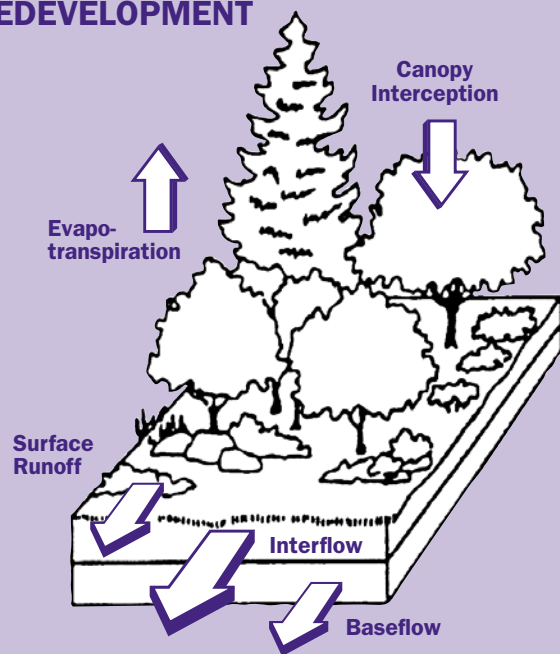
Impact of Impervious Cover

Development involves the construction of hard surfaces, such as roofs, roads, sidewalks, and parking lots, that water cannot penetrate. These types of surfaces are collectively referred to as “impervious cover.” Impervious cover increases the amount of water that will run off land during a rainstorm or as snow melts, which can lead to

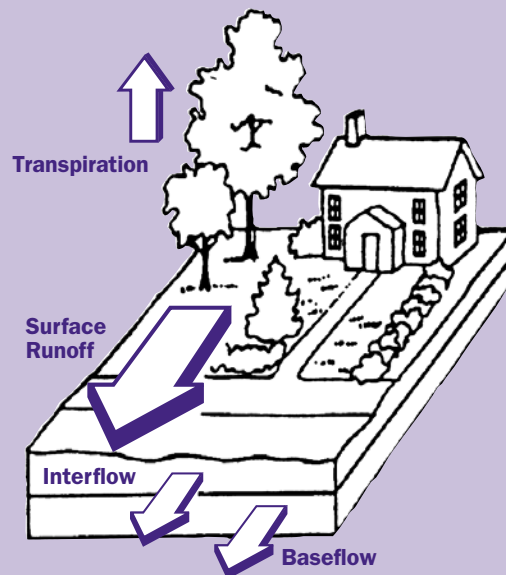
increased NPS pollution. Numerous studies have examined the relationship between the amount of impervious cover in a watershed and the health of waterbodies in that watershed. These studies find that the quality of streams, wetlands, and other waterbodies declines sharply when the impervious cover within the watershed

exceeds just 10 percent. Land use practices that reduce runoff or intercept runoff before it reaches a waterbody help reduce the impacts associated with impervious cover. Allowing water to infiltrate into the ground helps clean the water and restore groundwater levels, which is especially important during times of drought. ■

PREDEVELOPMENT



POSTDEVELOPMENT



changes in the rate of flow of water, reduced amount of recharge or infiltration, and increased volume of water during storm events. Alterations to watershed hydrology can negatively affect aquatic habitat by lowering the water table, reducing base flows, increasing water temperatures, reducing shading of streams and rivers, and reducing the accumulation of natural biomass in streams and rivers.

Conventional stormwater management systems, including curbs, gutters, storm drains and piping, paired with a large structural BMP, such as a retention/detention pond, can help control peak flows and reduce water quality impacts. But, typically this does little to maintain natural hydrologic functions on the site, including natural infiltration rates or direction of water flow. Additionally, such traditional stormwater management systems are expensive and involve exten-

sive earthwork and installation of materials.

Alternatively, a more innovative stormwater management approach can provide increased opportunities for stormwater to infiltrate, better maintain natural watershed hydrology, and limit impacts to habitat. The alternative approach uses open, grassed channels to hold and convey water along with numerous smaller-scale BMPs and landscape features dispersed throughout a developed area to regulate water flow and remove pollutants. Vegetation is recommended as part of any stormwater management approach to stabilize soil, filter out pollutants, and reduce runoff volume; it can be as simple as vigorous plantings around new construction.

In addition to providing for effective stormwater management, new developments can also be located and designed in ways that minimize NPS pollution.

Municipalities can develop an education program and use their local planning and site plan and subdivision review processes to encourage the use of practices that minimize nonpoint source pollution.

BMPs for Areas of New Development

Both designing and locating new development offer opportunities to use BMPs to minimize NPS pollution.

Designing New Development

Conservation design minimizes the amount of land disturbed for development, maintains significant ecological areas in a natural state, and reduces the amount of impervious surface created. Energy and water efficiency also are maximized.

Following these practices provides other benefits in addition to protecting surface water quality. For example, the practices listed

below help maintain groundwater supplies by increasing infiltration of water into the ground; help protect wildlife habitat by maintaining undisturbed land, especially along wetlands, streams, and other riparian areas; and help reduce air pollution

from vehicle travel by encouraging more compact development that supports walking and biking and reduces vehicle use. Encouraging non-motorized transport through changes in design improves human health by improving air quality and by

engaging people in physical activity. Improved human health in turn reduces medical costs associated with bad air quality (such as asthma) and inactivity (such as obesity and heart disease), which saves money for all of us.

Low-Impact Development Design

An alternative, more innovative stormwater management approach—called “low-impact development (LID) design”—can provide increased opportunities for stormwater to infiltrate, better maintain natural watershed hydrology, and limit impacts to habitat. LID focuses on:

- 1 site design techniques that reduce runoff and maintain existing hydrologic features; and
- 2 site-level or “at-source” stormwater controls.

The fundamental LID site planning concepts include:

- using hydrology as a basis for designing new development;
- thinking “micromanagement” for stormwater control;
- controlling stormwater at the source;
- using simplistic, nonstructural stormwater control methods when feasible; and
- creating a multi-functional landscape and infrastructure.

Hydrology is integrated into the site planning process by first identifying and protecting the fol-

lowing areas important to the natural hydrology of the site: streams and their buffers, floodplains, wetlands, steep slopes, high-permeability soils, and woodland conservation zones. Future development is then located in remaining areas that are less sensitive to disturbance or have lower value in terms of hydrologic function. The development is then designed to minimize clearing and grading, minimize and disconnect impervious surfaces, minimize the quantity and velocity of surface runoff, and provide for on-site/on-lot management of runoff. Additionally, the existing topography and drainage pattern is maintained to disperse flow paths.

Whenever possible, LID designs use open, vegetated drainage systems in lieu of conventional storm drains. LID flow and conveyance systems are designed to maximize overland sheet flow, involve wider, rougher, and longer flow paths, and include pockets of vegetation (trees and shrubs) in the flow path. In addition, flows from large paved surfaces are

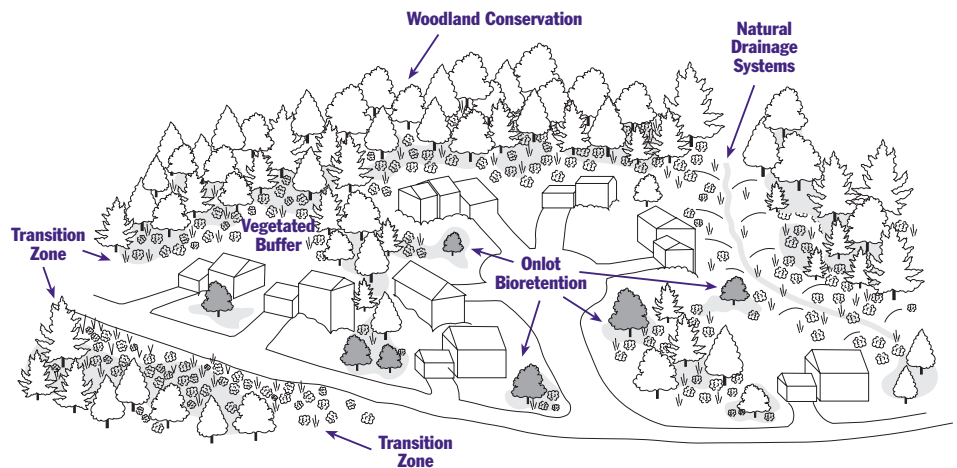
dispersed in multiple directions, using sheet flow when feasible.

In addition to the above design considerations, LID involves micromanagement of stormwater using small-scale integrated management practices (IMPs) distributed throughout the site. Example IMPs include on-lot bioretention facilities, dry wells, filter/buffer strips, grassed swales, bioretention swales, wet swales, rain barrels, cisterns, and infiltration trenches. These techniques are used to control runoff at its source. As with other BMPs, IMPs also require monitoring and periodic upkeep, including trash removal and maintenance of vegetation. But with education on the purpose and proper care for IMPs, private property owners can often assume responsibility for maintaining IMPs located on their property.

Communities that wish to benefit from the LID approach may need to develop an oversight program and adopt flexible zoning options in their subdivision and site plan ordinances to facilitate the use of LID techniques by developers. ■

Locating New Development

- Locate development close to existing developed areas.
 - Provide a greater chance of connecting to a sewer system, which reduces the possibility of NPS pollution from individual septic systems.
 - Require less pipe to connect to the sewer system, which lowers the chance for leakage of untreated wastewater, and lowers the cost of the project as well.
 - Shorten the distance to shopping and other services/activities to reduce vehicle travel, thereby reducing local air pollution, and increasing opportunities to walk or



bike. This can also reduce NPS pollution from the deposition of air pollutants.

- Locate close to existing roadways.
 - In addition to the above benefits, a shorter access road and/or driveway will

reduce the amount of impervious surface created by the development.

- Locate away from surface waters.
 - Increase opportunities for treatment of runoff before it reaches surface water.

Principles of Conservation Design

- Use narrower and shorter streets, driveways, and rights-of-way.
- Put sidewalks on only one side of the street.
- Allow for smaller lots and narrower setbacks and frontages to reduce the amount of land “disturbed” by development, maximize the amount of land retained in open space, and require less roadway and driveway.
- Reduce the size of parking areas and use permeable surfaces for overflow parking areas.
- Reduce the amount of area maintained as lawn, and use

drought-tolerant species of grass to reduce watering needs where grass is desired.

- Disconnect impervious surfaces (e.g., slope driveways towards lawns or other vegetated areas rather than the street).
- Maintain significant vegetated buffers for surface waters and do not mow to the edge of the water.
- Use open, grassed swales to convey stormwater rather than a curb and gutter system.
- Use all available natural resource information in designing the development.

- Integrate smaller-scale BMPs and landscape features throughout the site to manage stormwater and control NPS pollution.
- Require enhanced performance septic systems or regular septic system inspections when a development is not served by sewer.
- Encourage onsite collection or infiltration of rainfall/runoff from individual homesites (e.g., install rain barrels and cisterns to collect roof runoff, incorporate small bioretention areas or ‘raingardens’ on home sites to manage rainwater). ■

Many people think that urban areas are found only in large cities and towns, but many of New Hampshire's villages and small towns also have areas that are densely developed. Pockets of development in rural towns, such as shopping centers, have some of the same water quality issues that cities do. The practices discussed in this section apply to any developed area.

Developed areas typically have higher amounts of impervious surfaces and existing stormwater drainage systems. Many older stormwater drainage systems collect water and pollutants from impervious surfaces and discharge them directly to a stream, river, or other surface water body. As a result, watershed hydrology is impacted and pollutant loads increase.

To reduce NPS pollution, management of developed areas can take steps to prevent pollutants from entering stormwater. Additionally, urban and developed areas can be retrofitted by installing structural BMPs to reduce, collect, and treat stormwater. Redevelopment and renovation of existing sites provides excellent opportunities for improving stormwater management and reducing NPS pollution. DES has written a guide summarizing innovative retrofit BMPs called *Innovative Stormwater Treatment Technologies: Best Management Practices Manual*.

DES has produced other BMP manuals specifically for developed areas, *Best Management Practices for Urban Stormwater Runoff* and *Stormwater Management and Erosion and Sediment Control Handbook for Urban and Developing Areas in New Hampshire*. The first guide covers the BMPs required by the DES Alteration of Terrain Permit Program. The second is a comprehensive reference for structural and vegetative BMPs, such as detention basins, level spreaders, grassed waterways, and others.

An additional guidance document, *Managing Stormwater as a Valuable Resource: A Message for New Hampshire Municipalities and Water Suppliers*, provides information on managing stormwater to protect water supply resources and the conditions under which artificial infiltration BMPs, such as infiltration

trenches and infiltration basins (or ponds), can be used.

Planning boards may need to enlist professional engineering services to review development proposals. Such services may be available through county conservation districts, regional planning agencies, and private consultants.

BMPs for Previously-Developed Areas

The following practices and structural BMPs can reduce NPS pollution from existing developed areas:

General Guidelines

- Use vegetation extensively to filter runoff before it enters surface waterbodies.
- Divert runoff around sites where pollutants could be picked up by surface flow (e.g., gas stations).





- Inspect areas periodically to make sure that potential pollutants, such as raw materials for an industrial process, are not left in areas where they can be transported by runoff into waterbodies.
- Keep parking areas, outdoor storage areas, and streets clean of debris. Street sweeping can be used to remove sediment, debris and trash from streets and parking areas.
- Clean out catch basins and other flow control devices regularly to prevent backup and overflow of sediments and pollutants.

Specific Structural BMPs

■ Bioretention Area

A practice to manage and treat stormwater runoff by using a conditioned planting soil bed and planting material to filter runoff stored within a shallow depression. The system can include the following components: a pre-treatment filter strip of grass in an inlet channel, a shallow surface water ponding area, a bioretention planting area, a soil zone, an underdrain system, and an overflow outlet structure. For example, vegetated islands in parking lots can be recessed, rather than raised, and designed as bioretention areas.

■ Grassed Swale

An engineered grassed channel to transport stormwater. Dry swales facilitate quality and quantity control by

allowing for infiltration. Wet swales use retention time and natural growth of water-tolerant vegetation to regulate flow and quality of stormwater before discharge.

■ Infiltration Trench

An excavated trench that is backfilled with stone to form a subsurface basin. Water is slowly infiltrated into the soil, usually over several days. Most effective when combined with some form of pretreatment, such as a filter strip, to reduce the amount of sediment reaching the trench.

■ Infiltration Basin or Pond

A grassed, flat-bottomed basin preceded by a sediment forebay or riprap apron to slow the flow of water and trap sediment. Water is slowly infiltrated into the soil, usually over several days.

■ Dry Well

A small excavated pit back-filled with aggregate, usually pea gravel or stone. Used to infiltrate runoff from building rooftops and in modified catch basins, where the inflow is direct surface runoff.

■ Stormwater Treatment Chamber

An underground, divided chamber used to remove sediment, oil and debris from stormwater. Such chambers are typically used in conjunction with a stormwater retention or infiltration BMP.



As of March, 2003, the National Pollutant Discharge Elimination System (NPDES) Stormwater Phase II rule (“Phase II”) requires operators of small municipal separate storm sewer systems (called MS4s), operators of municipally-owned industrial activities, and operators of small construction sites (one acre or more) to implement programs and practices to control polluted stormwater runoff. More information on these regulations can be found at www.des.nh.gov/stormwater.

Local planning boards are authorized to regulate subdivisions and nonresidential and multi-family residential site development under **RSA 674:35** and **674:43**, respectively. The requirements for developing a local master plan are found under **RSA 674:1-4**. Zoning ordinances are covered under **RSA 674:17-20**. Innovative land use controls are described under **RSA 674:21**.

The Comprehensive Shoreland Protection Act (**RSA 483-B**) establishes minimum standards for the future subdivision, use, and development of the shorelands within 250 feet of the state’s public waters. When repairs, improvements, or expansions are proposed to existing development, the law requires these alterations to be consistent with the intent of the Act. DES is responsible for enforcing the standards within the protected shoreland, unless a community adopts an ordinance or shoreland provisions that are equal to or

All state laws in New Hampshire can be searched online at gencourt.state.nh.us/rsa/html/indexes/default.html

more stringent than the Act. In addition to the standards of the Act, development within the protected shoreland must always comply with all applicable local, state, and federal regulations.

Site excavation is governed by **RSA 485-A:17**, known as the Alteration of Terrain or Site Specific Permit Program. Development as well as redevelopment activities may require a permit under this program. Please see page 23 for more information.

RSA-482-A and the rules promulgated under that law (**Env-Wt 100-700**) require that projects be designed to avoid and minimize impacts to wetlands and other jurisdictional areas. The impacts that are proposed must be only those that are unavoidable. It is

the responsibility of the applicant to document these considerations in the application for a permit.

RSA 485-A gives DES the authority to regulate septic systems. Design, operating, and permit requirements are found in Administrative Rule **Env-Ws 1000**. The regulations require all subdivisions creating lots smaller than five acres to obtain approval from DES. If the site lies within a protected shoreline area, all lots, regardless of size, require approval from DES (**RSA 483-B**). Any developed waterfront property on great ponds and tidal waters with an on-site subsurface system must be assessed for compliance with current standards prior to the execution of a purchase-and-sale agreement (**RSA 485-A:39**).

What the Implementation of Phase II Means

For regulated MS4s, six minimum control measures must be implemented within five years of receiving the Phase II permit. Permittees must submit an annual report to EPA summarizing their progress toward achieving specific measurable goals in the six categories.

EPA has issued guidance on recommended BMPs and developing measurable goals and conducted a series of workshops on the Phase II requirements. DES is providing technical and financial support whenever possible.

Six Minimum Control Measures

1. Public education and outreach
2. Public participation and involvement
3. Illicit discharge detection and elimination
4. Construction site runoff control
5. Post-construction runoff control
6. Pollution prevention and good housekeeping

For assistance with local land use planning and regulations, local officials are encouraged to contact their regional planning agency, county conservation district, the N.H. Office of State Planning and Energy Programs, or DES (many of these are listed in the Appendix). These organizations can also help identify other federal, state, and local technical assistance and educational programs.

DES Phase II Website

www.des.nh.gov/stormwater/

DES Fact Sheets

Federal Stormwater Permits. WD-WEB-8, 2002. Available online at: www.des.nh.gov/factsheets/wwt/web-8.htm

Impacts of Development Upon Stormwater Runoff. WD-WQE-7, 1996. Available online at: www.des.nh.gov/factsheets/wqe/wqe-7.htm

See page 38 for DES fact sheets describing the Alteration of Terrain Permit program.

DES. For more information on the Comprehensive Shoreland Protection Act, see www.des.nh.gov/cspa/

DES. *Best Management Practices for Urban Stormwater Runoff*. R-WSPCD-95-3, January 1996. Copies (\$5 each) can be ordered from DES by calling (603) 271-2975.

DES Drinking Water Source Protection Program. *Managing Stormwater as a Valuable Resource: A Message for New Hampshire Municipalities and Water Suppliers*. DES-R-WD-01-13, September 2001. Online at www.des.nh.gov/dwspp/stormwater.pdf.

DES Wetlands Bureau. *Guidebook for Wetlands Permit*. www.des.nh.gov/wetlands/guidebook/

DES Watershed Management Bureau. *Innovative Stormwater Treatment Technologies: Best Management Practices Manual*. DES-WD-02-2, May 2002. Online at www.des.nh.gov/wmb/was/manual.

Rockingham County Conservation District and DES. *Stormwater Management and Erosion and Sediment Control Handbook for Urban and Developing Areas in New Hampshire*. August 1992. Copies (\$25 each) can be ordered from DES by calling (603) 271-2975.

USDA Natural Resources Conservation Service, NH office. *Municipal Guide for Nonpoint Source Pollution*. Fact sheet available by calling (603) 868-7581.

USEPA Office of Water. *Low Impact Development (LID): A Literature Review*. Washington DC. EPA 841-B-00-005, October 2000. Online at www.epa.gov/owow/nps/lid.pdf.

USEPA Websites

Fact sheets on each of the minimum measures and other aspects of the Phase II rule are available on the EPA's website, <http://cfpub.epa.gov/npdes/stormwater/swfinal.cfm>

Complete information on EPA's stormwater program is online at http://cfpub.epa.gov/npdes/home.cfm?program_id=6

Terrene Institute. *Nonpoint Source News-Notes*. An occasional bulletin. 4 Herbert St., Alexandria, VA 22305. Online at www.epa.gov/owow/info/NewsNotes

Center for Watershed Protection. "The Benefits of Better Site Design in Residential Subdivisions," article #46 in *The Practice of Watershed Protection*, 2000, editors Thomas R. Schueler and Heather K. Holland, Ellicott City, MD. Available online at www.stormwatercenter.net/Library/Practice/46.pdf or from the Center for Watershed Protection, 8391 Main Street, Ellicott City, MD 21043, (410) 461-8323.

Center for Watershed Protection. *Better Site Design: A Handbook for Changing Development Rules in Your Community*. August 1998. See reference above for ordering information or go online at www.cwp.org/index.html. This handbook discusses 22 design principles to address NPS pollution and conserve natural areas. It provides detailed information on the current practice, preferred approach, and current perceptions regarding residential streets and parking areas, residential developments, conservation of natural areas, and open space.

Center for Watershed Protection. *Stormwater BMP Design Supplement for Cold Climates*. 1997. See above reference for ordering information; publication is online at www.cwp.org/cold-climates.htm.

Center for Watershed Protection. *The Practice of Watershed Protection*, 2000, editors Thomas R. Schueler and Heather K. Holland, Ellicott City, MD. Available online at www.stormwatercenter.net/Library/Practice/46.pdf or from the Center for Watershed Protection, 8391 Main Street, Ellicott City, MD 21043, (410) 461-8323.

Center for Watershed Protection. Stormwater Manager's Resource Center at www.stormwatercenter.net is a website designed for stormwater practitioners, local government officials, and others that need technical assistance on stormwater management issues.

Metropolitan Council Environmental Services. Minnesota Urban Small Sites BMP Manual: *Stormwater Best Management Practices for Cold Climates*. Prepared by Barr Engineering Company, 2001. Metropolitan Council Environmental Services, Mears Park Center, 230 E. 5th St., St. Paul, MN 55101. Available at www.metrocouncil.org/environment/Watershed/BMP/manual.htm

Department of Environmental Resources, Prince Georges County, Maryland. *Low-Impact Development Design Strategies: An Integrated Design Approach*. Programs and Planning Division, June 1999. Available online at www.epa.gov/owow/nps/lidnatl.pdf



3 BEST MANAGEMENT PRACTICES BY LAND USE/ACTIVITY

This section identifies some of the land uses that generate NPS pollution, lists ways to control pollution by land use, and provides a list of resources.

Reducing NPS Pollution Around Your Home

There are a number of BMPs that a household can employ to reduce their contributions to NPS pollution. Although each individual household may contribute only minor amounts of NPS pollution, the cumulative effects of household-level action to reduce pollution by an entire neighborhood or region of households can be significant.

Potential household contributions to NPS pollution include:

- bacteria, chemical, and nutrient discharges from septic systems;
- chemical use, storage, and disposal;
- sediments, chemicals, and nutrients from lawn and garden activities;
- runoff from impervious surfaces (e.g., driveways, roofs, patios);
- pet waste; and
- air pollution contributions, from energy use and vehicle use.

Septic Systems

A proper, well-maintained septic system will adequately treat your sewage. If it is not taken care of, a septic system may become clogged and overflow on the ground or cause wastewater to back up into the house. A failed system is unhealthy, expensive to replace, and may contaminate nearby ground and/or surface waters, including nearby wells. Taking a few precautions can avoid costly septic system problems.

- Know the location of your septic tank and leaching area; mark the tank cover(s) with partially buried bricks.
- Have your tank inspected yearly. If the sludge and surface scum combined are as thick as one third the liquid depth of your tank, have the tank pumped out by a licensed septage hauler.
- Keep bulky items such as disposable diapers, sanitary pads, cigarettes, or paper towels out of the system. These will clog the leaching system.
- Keep toxic materials such as paint thinner, pesticides, or chlorine out of your system. These chemicals may kill the necessary bacteria in the tank.
- Do not use septic tank additives. They may cause harm by killing essential bacteria.
- Repair leaking fixtures promptly; use water-reducing fixtures wherever possible to reduce the amount of water the system must treat.
- Avoid putting food waste and grease into the system or using a garbage disposal. Food waste will not only fill your septic tank rapidly and require more frequent pumping, but will also float and can eventually clog the leaching system.
- Keep deep-rooted trees and bushes away from the leach field.
- Keep vehicles, livestock, or heavy foot traffic away from the leach field, as the weight may compress the soil too much or break the pipes.
- Minimize the use of detergents and bleaches; use alternative cleaning products such as baking soda, borax, or non-chlorine scouring powders. Many cleaning products such as toilet bowl cleaners contain chlorine and strong acids that will kill the necessary bacteria in the septic system.

Chemical Use, Storage and Disposal

Hazardous household products such as cleaners, paint thinner, spot remover, oven cleaner, furniture polish, drain opener, pool chemicals, and even hair spray can be found in most home storage cabinets. Hazardous products can usually be identified by a warning label on the container. These products, when handled improperly, can contaminate a well, poison a stream, or disrupt the proper functioning of a septic system.

- Buy nontoxic alternatives whenever possible.
- Read the label carefully before buying, using, or disposing of products.
- Buy only the quantity that you need and use only the recommended amount.
- Store and label wastes safely, then bring them to a local household hazardous waste day collection (contact DES at 271-2047 for locations near you). Many towns also accept used oil for recycling.
- Hazardous chemicals should NOT be poured on the ground or down the drain, discarded in the trash, buried, or burned!



Lawn and Garden Activities

Landscaping and gardening practices can contribute to NPS pollution through lawn chemicals, fertilizers, silt, and sand. However, with a few minor changes, backyards can actually play an active role in improving water quality.

- Test your soil to know what it actually needs before you apply fertilizer or lime (contact your county UNH Cooperative Extension office for information on soil testing).
- When fertilizer is necessary, select a slow-release fertilizer to avoid excess nutrients running into the water. Under the Shoreland Protection Act, a 25-foot fertilizer-free buffer must be maintained around wetlands and surface water.
- Plant natural, native plant species instead of non-native plants (plants that were introduced for agricultural purposes or by accident). Native plants generally require much less water, herbicides, fertilizers, or trimming.
- When possible, reduce the size of your lawn by planting low-maintenance ground-covers, trees, flowers, and shrubs to help water infiltrate into the ground and prevent soil erosion.
- For new lawns, use 6-12 inches of topsoil to encourage deeper root growth
- For waterfront or wetland areas, maintain or plant a natural vegetation buffer at least 100 feet wide between the lawn and the water to hold soil in place, absorb pollution before reaching the water, and provide wildlife habitat. Some species of wildlife require more than 100 foot buffers.
- Start composting in your backyard and use compost on your gardens and lawns and around trees and bushes. Composting your yard and food waste is easy and will reduce the need for fertilizers and water by adding nutrients and helping the soil retain moisture.
- Refrain from using pesticides near surface water.
- Read pesticide labels carefully.



BMPs BY LAND USE/ACTIVITY

Impervious Surfaces

Runoff from stormwater washes across yards, driveways, roads, and patios, picking up loose soil, pet wastes, fertilizers, pesticides, oil, soaps, and other pollutants and depositing them into streams, rivers, and lakes. Water directed to pervious surfaces will help filter many of these possible contaminants before entering our surface waters in addition to recharging our groundwater supplies.

- Limit the amount of impervious surface on your property (impervious surfaces include sidewalks, roofs, driveways, and patios).
- Replace impervious surfaces with natural ground cover or with material that allows some water to seep into the ground, such as gravel, brick, stepping stones, wood chips, or other porous surface.
- Direct runoff from impervious surfaces to areas on your property where the water can seep into the ground. For example, direct roof downspouts away from the driveway or the storm drainage system and into a gravel swale or grassed area, or collect roof runoff in a screened-top rain barrel and use to water plants around your yard.
- Maintain or restore natural vegetated areas as buffers along river, lake, and coastal waterfronts.
- Sweep driveways and walkways instead of hosing them down.

Pets

Scooping your pooch's poop isn't just a neighborhood courtesy; it is also the healthy and environmentally sound thing to do. Pet waste may be a source of bacteria and nutrients in water. Just as we don't want human sewage in our water, it is important to prevent pet waste from littering our towns and being carried into our waterways. People drinking and swimming in water contaminated by pet waste could ingest harmful pathogens.

- Pick up pet waste and flush it down the toilet, bury it in the yard, or put it in the trash. Another option is to install an underground pet waste digester that works like a small septic tank. Some local laws or neighborhood rules may restrict their use.
- Do not put pet waste into storm drains.

Air Pollution – Acid Deposition

Through rain or snow, acid deposition deposits acids and acidifying compounds to the Earth's surface, which then move through soil, vegetation, and surface waters. Acid deposition is formed when emissions of sulfur dioxide and nitrogen oxides react with other substances in the atmosphere to form the acidic compounds. Sulfur dioxide and nitrogen oxides are emitted primarily from power plants and motor vehicles as a result of burning fossil fuels.

Acid Deposition leads to adverse impacts such as increased mortality among sensitive species, decreased visibility, and stunted forest growth. In addition, soils that are saturated with nitrogen have little capacity to buffer acid rain before it enters streams. The use of nitrogen fertilizers, nitrogen-fixing crops, and fossil fuels has doubled and continues to increase the rate of nitrogen entering the land.

- Reduce your use of electricity (turn off lights, turn down thermostats, hang laundry to dry, take quick showers, etc.).
- Drive your car less by carpooling, biking, walking, and combining trips.
- Maintain your car's pollution control equipment, keep your tires properly inflated, and keep your engine tuned.
- When buying a new appliance, such as a refrigerator or clothes dryer, put energy efficiency at the top of your list of desirable features and look for the Energy Star label indicating the item is energy efficient.
- When buying a new vehicle, ask the car dealer for a Granite State Clean Car and look for the Clean Cars Label indicating the vehicle meets lower emission standards and better fuel economy.
- Contact your electric utility to see what it is doing to reduce emissions.

Laws and Regulations

A complete copy of the rules governing septic systems in New Hampshire **Env-Ws 1000**, Subdivision and Individual Sewage Disposal System Design Rules is available at www.des.nh.gov/rules/envws1000.pdf. Hardcopy available at DES, 29 Hazen Drive, Concord, NH 03301, (603) 271-2975 for \$10.

More information on the **Shoreland Protection Act** is available at www.des.nh.gov/cspa.

Under **RSA 261:153(V)** and **RSA 149-M:18**, city treasurers and town clerks can assess a fee to pay for collection and disposal fees of motor oil, car batteries, and car

tires. A Vehicle Registration Fees fact sheet is available at www.des.nh.gov/sw.htm or call DES at (603) 271-2975.

After January 1, 2005, owners of on-premise heating oil tanks must meet DES “Best Management Practices for the Installation or Upgrading of On-Premise-Use Heating Oil Tank Facilities.” On-premise-use facilities include heating oil tanks and piping located at single family homes, apartments, commercial buildings, and industrial facilities.

Failure to achieve compliance by that date will prevent access to the state cleanup funds should an oil release occur. To assist owners in meeting this new requirement, **RSA 146-E** authorizes a grant program (up to \$1,000) for owners who demonstrate a financial need. For more information, see DES fact sheet *OIL-24: Best Management Practices for the Installation and Upgrading of On-Premise-Use Heating Oil Tank Facilities* at www.des.nh.gov/factsheets/oil/oil-24.htm.

All state laws in New Hampshire can be searched online at gencourt.state.nh.us/rsa/html/indexes/default.html

See BMP Resources on page 38

Site excavation and development, road construction, and road maintenance activities may not last long, but erosion and sedimentation from any earth moving can have long-term impacts on water quality. Towns may face financial impacts from removing sediments from ditches, culverts, and drains.

The road building process is more susceptible to erosion problems than other types of construction. Drainage ditches and

channels built along roads to carry stormwater will erode easily before they are properly stabilized. Site excavation and development may make soil and attached chemicals more available, resulting in polluted lakes and streams. Bare soil particles are dislodged by rainfall and can be transported down slope to streams, lakes, and wetlands. The extent of erosion is influenced by exposure, rainfall intensity and duration, soil type, vegetation, topography, and season.

The sedimentation or deposition of material eroded by water from site excavation or road construction and maintenance activity can have significant negative effects on water quality and aquatic habitats from increased sedimentation. In addition to

habitat losses for fish and invertebrates, wetlands can fill in and vegetation can be smothered; culverts and ditches can be plugged; and recreational potential can be reduced when soil loss from excavation activities is high. Nutrients and chemicals can be released from sediment that enters a waterbody. Released phosphorus can cause algal blooms in lakes and encourage eutrophication.

Construction sites may use numerous chemicals at the site, such as pesticides, fertilizers, petroleum products and construction chemicals. Solid wastes and sometimes hazardous wastes may also be handled on site. The “Chemicals and Petroleum Products” section of this document discusses BMPs for preventing NPS pollution from these sources.



BMPs for Site Excavation and Road Construction

The following list identifies some of the BMPs for developers and road designers to consider.

- Optimize nonpoint source pollution control by integrating BMPs into the overall site development plans.
- Prepare field documents for the construction crew and the planning board, with clear instructions and dimensions for erosion control measures.
- Municipalities can provide quality assurance, including professional plan review and detailed field checks during construction.
- Retain natural vegetation where possible, especially near waterbodies, wetlands, and steep slopes.
- Minimize the amount of bare soil exposed by scheduling phases of construction and stabilization.
- Prevent erosion by covering bare soil with mulch or other cover.
- Establish vegetative cover with good root systems prior to freeze/thaw cycles.
- Minimize slope lengths and divert runoff around disturbed areas.
- Construct and install stable outlets for all ditches and stormwater sewer systems prior to building the ditches and pipe outlets.
- Provide outlet protection at waterways, culverts, and storm sewers to dissipate the energy of water conveyed through a pipe or paved channel before it discharges to the receiving stream.
- Protect treatment swales from turbulence and sediment accumulation.
- Consider wet ponds and constructed wetlands to improve water quality where detention is required.
- Monitor practices and adjust, maintain, and repair them periodically and after every storm.
- Remove temporary measures only after construction is completed. Remove sediment accumulated during construction from permanent BMPs once construction activities are completed.
- Design roads to minimize the amount of impervious surface created and maximize opportunities for on-site treatment of stormwater.
- Minimize or avoid constructing roads near sensitive areas such as wetlands, lakes, rivers, or streams.
- Avoid building roads up and down steep slopes. Follow the contours of the land as much as possible.
- Protect existing stormwater inlets and culverts from sediment by using temporary sediment traps, silt fence and hay bale filters, or perforated risers.

Laws and Regulations

Site excavation and road construction activities are governed by **RSA 485-A:17**, known as the Alteration of Terrain Program or Site Specific Permit Program. Under this program, individuals are required to obtain a permit from DES for any earth disturbance greater than 100,000 square feet, or 50,000 square feet within a protected shoreland area. Protected shoreland is any land within 250 feet of the public boundary of public waters,



which includes all waterbodies with a surface area of 10 acres or more, all fourth order or higher water courses, estuaries, and coastal waters. The program's administrative rules are found in **Env-Ws 415** (www.des.nh.gov/rules/env415.pdf). Permits typically contain erosion control provisions, which include requirements for installation of BMPs, such as detention ponds, sedimentation ponds, treatment swales, and vegetated buffer strips. The permit involves both temporary erosion control meas-

ures during construction and permanent controls for stormwater following construction.

Construction sites (including road construction areas if soil is disturbed) that disturb one or more acres must obtain a NPDES permit under the **Phase II Stormwater Regulations**. The federal permit requires pollution prevention plans to reduce pollution at the construction site. The components of pollution prevention plans are similar to BMPs required by the DES Site Specific Permit Program. See

www.des.nh.gov/stormwater/construction.htm for more information.

As of November 2003, DES is developing a new Administrative Rule (**Env-Wt 303.05(q)**) that would allow for a notification process for certain road maintenance activities conducted in accordance with best management practices detailed in the manual titled *Best Management Practices for Routine Roadway Maintenance Activities in New Hampshire* (NHDOT, August 2001).

In New England, plowing, sanding, and de-icing are standard techniques used to keep roadways passable and safe for traveling during the winter. Runoff from melting snow carries accumulated pollutants and street and soil surface materials. In urban areas, plowed snow sometimes needs to be moved to a remote location, and the resulting stockpile holds accumulated pollutants. Salt storage is also a concern if runoff from the storage site is not adequately controlled.

Pollutants accumulate in snow through several processes. In the atmosphere, falling snowflakes are effective scavengers of existing particulate and aerosol pollutants. After the snow has fallen, the snowpack is subject to deposition of airborne pollutants originating from fossil fuel combustion, trash incineration, chemical processing, metal plat-

ing, and manufacturing. Snow also accumulates pollutants from gas, oil, and metals from car leaks and wearing parts, direct application of salt, sand, and roadway deterioration. This phenomenon is familiar to everyone who has noticed older snow piles getting black and gray.

Impacts from the application of sodium chloride on roads are important for both drinking water safety and the protection of aquatic life. Sodium is a drinking water concern for individuals on low-sodium diets. Chloride in drinking water is a taste concern, but not a health concern. EPA has studied the impact of chloride ions on aquatic life and found that chloride associated with sodium was toxic to certain forms of aquatic life at a four-day average concentration of 230 mg/l. Some plant species at the base of the food chain can be

harmed at much lower concentrations.

Applying salt to roadways undoubtedly prevents crashes and saves lives, but it also has an economic cost because of increased corrosion on automobiles and highway structures such as bridge decks. Minimizing the application rate of salt without affecting safety therefore has economic benefits as well as ecological ones.

BMPs for Road Salting and Snow Dumping

Application of Road Salts

- Sensitive areas, such as public water supplies, lakes, and ponds, should be identified and made known to salt applicators. Consider de-icing alternatives (calcium magnesium acetate, sand, etc.) in sensitive areas.
- Ground-speed controllers should be used for all spreaders.

- Give salt time to work; plowing operations should be timed to allow maximum melting by salt before snow is plowed off the road.
- Know when to plow and reapply salt. The need for another salt application can be determined by watching melting snow kicked out behind vehicle tires. If the slush is soft and fans out like water, the salt is still working. Once the slush begins to stiffen and is thrown directly to the rear of vehicle tires, it is time to plow.
- For lesser traveled roads, consider applying salt in a 4-8 foot strip along the centerline of a two lane road. Less salt is wasted with this pattern and quickly gives vehicles clear pavement under at least two wheels. Traffic will soon move some salt off the centerline and salt brine will move toward both shoulders for added melting across the entire road width.
- Determine levels of service for all roads in a service area. Salt application rates and frequency should be based on traffic volume, road grade and curvature, intersections, and weather conditions. Sand or sand/salt mix should be used based on the level of service requirements.
- At the end of the season, sweep accumulated salt and sand from roads to prevent further runoff of pollutants.

Snow Dumping

- Disposed or stockpiled snow should be stored on pervious surfaces, such as grass, where it can infiltrate through soils. Storage should be on flat areas, and at least 25 feet from the high water mark and/or edge of the bank of the surface water. Certain studies suggest that a 100-foot setback provides greater protection to sensitive species and water quality.
- Secure a silt fence or equivalent barrier between the snow storage area and the water body.
- The snow storage area should be a least 75 feet from any private water supply wells, at least 200 feet from any community water supply wells, and at least 400 feet from any municipal wells. (Note: snow storage areas are prohibited in wellhead protection areas [class GAA groundwater]).
- All debris should be removed prior to snow storage, and new debris should be cleared from the site and properly disposed of no later than May 15.

Storage of De-icing Compounds

- Store de-icing compounds on sheltered, impervious surfaces.
- Locate salt piles at least 100 feet from streams and flood plains.

- Direct internal drainage to a collection system and keep stormwater flow outside of shelter.

Laws and Regulations

The Groundwater Protection Act, RSA 485-C, contains provisions relative to salt storage and use. The Act lists “salt storage and use for winter road and parking lot maintenance” as a potential contamination source. Potential contamination sources must be inventoried and managed in Class GAA and GA1 groundwater, which are wellhead protection areas and areas of locally valuable groundwater, respectively. Reclassification of groundwater can be requested by local water suppliers. New outdoor salt storage facilities and snow dumps are prohibited in class GAA groundwater.

RSA 483-B:9, Minimum Shoreland Protection Standards, prohibits the establishment or expansion of salt storage yards within the protected shoreland, which is all land within 250 feet of lakes and ponds greater than 10 acres in size, larger rivers, and estuaries and coastal waters.

RSA 485-A:13 prohibits the disposal of any waste to the surface water or groundwater of the state without first obtaining a written permit from DES. Plowed snow also contains waste and therefore requires a permit prior to disposal in surface water.

All state laws in New Hampshire can be searched online at gencourt.state.nh.us/rsa/html/indexes/default.html

Vehicle Salvage and Storage Facilities

Cars are the #1 recycled product in the U.S. At least 95 percent of all cars scrapped in the U.S. are collected for reuse and recycling, and approximately 75 percent of the material in a scrapped car is currently recycled. Motor vehicle salvage facilities (MVSFs) perform a valuable service that ultimately saves energy and natural resources, in addition to reducing air and water pollution that would be generated to make new parts. However, salvage yards also handle wastes that are potentially harmful to public health and the environment if they contaminate the soil, air, surface water, and groundwater.

Although the exact number has not yet been determined, DES has identified several hundred MVSFs in New Hampshire. For the purpose of this publication, the term MVSF includes towing yards, salvage pools, auto recyclers/dismantlers, and scrap processors. These facilities range from temporary storage areas for damaged cars to retail businesses for used auto parts to places where the “hulks” are shredded and sold for metal scrap.

Potential hazardous wastes at an MVSF include used oil, improperly drained oil filters, mercury switches, engine coolants contaminated with oil and fuel constituents, refrigerants, intact air bag cartridges, batteries, lead parts (wheel weights, etc.), soiled shop towels, spent degreasers and other solvents,

spill absorbents, fuel tanks containing fuel and residues, and other items. The primary pollutants of concern include fuel and oil constituents, heavy metals, acids, and suspended solids.

BMPs for Motor Vehicle Salvage and Storage Facilities

- Drain vehicles, parts, and cores soon after vehicles enter the facility. Undrained vehicles stored on bare ground should have drip pans under places where leaks can occur.
- Dismantle vehicles and parts on a curbed, impermeable concrete surface with spill controls in place, such as drip pans and absorbent materials. If draining is done outdoors, the work area should be covered to keep rainwater from collecting and to prevent contaminated runoff from rain or melting snow.
- Deposit collected fluids in structurally sound storage containers. Batteries should be stored properly.
- Clean up spills immediately. Dispose of absorbents properly.
- Remove all fluids from vehicles before crushing, and recycle or dispose of fluids.
- Standardize your procedures using a checklist. See an example checklist on the Web at www.pca.state.mn.us/air/pubs/mvsf_frm.pdf.

Laws and Regulations

In New Hampshire, MVSF activities are regulated under several independent programs within local, state, and federal government, none of which provide comprehensive environmental oversight. The New Hampshire Green Yards Program has been designed to improve environmental compliance at MVSFs through facility registration, BMP guidance, and operator training. The DES program is designed to augment, not duplicate, the following existing regulatory programs:

RSA 236:111-129 requires MVSFs to obtain location approval and an annual license to operate from a municipality. Noncompliant facilities can be declared a nuisance and shut down under local authority.

RSA 236:90-110 requires MVSFs along certain federally-funded highways to obtain location approval and an annual license to operate from the N.H. Department of Transportation.

RSA 149-M provides comprehensive authority for DES to regulate solid waste management facilities. MVSFs are a type of solid waste management facility and must therefore comply with the rules adopted under **RSA 149-M** that prescribe proper management of various types of solid waste generated when dismantling a vehicle. See Administrative Rules **Env-Wm 100-300, 2100-**

All state laws in New Hampshire can be searched online at gencourt.state.nh.us/rsa/html/indexes/default.html

3700 (www.des.nh.gov/rules/swrules.pdf). In the future, DES may also require MVSFs to become registered or permitted under **RSA 149-M** and MVSF operators to obtain training through the solid waste facility operator training program.

RSA 147-A authorizes DES to regulate hazardous waste as implemented under Administrative

Rule Env-Wm 100-1000 (www.des.state.nh.us/hwrb/hwrules.pdf).

RSA 146-A and **Env-Ws 1402** authorize DES to regulate aboveground oil storage tanks.

RSA 485-C authorizes DES to implement a groundwater protection program. The program includes a requirement for MVSFs, if located within certain groundwater protection areas, to

obtain a release detection permit from DES. Through the DES groundwater/drinking water protection program, MVSFs are also subject to the administrative rules **Env-Ws 421** that prescribe BMPs for groundwater protection.

40 CFR 122 (Federal NPDES regulations) require MVSFs to obtain storm water management permits from EPA for discharging surface runoff from a point source (such as from storm drains, culverts, ditches, swales).

See BMP Resources on page 41

Water-based recreation is one of New Hampshire's primary industries, and its economic success is dependent on a healthy environment. Marinas provide important services such as maintenance and repair, fueling, and winter storage for boats. They also provide residents and vacationers access to public waters. Because of their location at the water's edge and the types of services that they perform, marinas can act as a conduit for nonpoint source pollution. Nevertheless, according to the EPA, marinas present a minor source of pollution compared to the overall contribution of non-point pollution from sources such as urban areas and agriculture.

For several years in the early 1990s, DES biologists monitored water quality at three marinas on Lake Winnepesaukee (DES, 1995). DES observed that a decrease in lake quality at the marinas was the result of two primary pollutant pathways. The

first source was accidents or spills at dockside fueling stations. Unlike land based fuel stations where a small spill can be easily cleaned up, one gallon of fuel spilled into the water can cover as much as one square mile of the water surface if not immediately contained. Gasoline is toxic to freshwater and marine organisms. The second major pollutant pathway identified in the study was the funnel effect created by boat ramps. At most marinas, boat ramps act as a conduit linking the parking lot and maintenance areas directly to the water. Storm water runoff and boat wash runoff can pick up a wide variety of contaminants, including petroleum products, heavy metals, bacteria, and nutrients.

Other pollutants generated at a marina include pathogens (pet waste and overboard sewage discharge), fish waste (dockside fish cleaning), toxic metals (from antifoulants), and phosphorus-

based detergents, which can cause algal blooms, decrease water clarity, reduce oxygen levels in the water, and impact fish and other aquatic organisms. Marinas are also the place where exotic species, such as variable milfoil, may be introduced if a boat from an affected waterbody has not been properly washed before it is launched at the marina.



BMPs for Marinas

- Use only phosphate-free detergents and establish a wash area over an infiltration trench or a vegetated swale. If possible, use a high-pressure sprayer with no detergents, or wait until the boat is out of the water to clean it.
- Perform periodic engine maintenance (e.g., changing oil, winterizing) out of the water. Propylene glycol should be substituted for ethylene glycol antifreeze when winterizing engines. The oxidation of propylene glycol yields pyruvic and acetic acids, which are not toxic to aquatic organisms.
- Scrape, sand, sandblast, and paint boats away from the open where dust, paint chips, or paint spray can be blown into the water. Whenever these types of practices are conducted, appropriate containment devices should be used.
- Install containment booms at fueling stations. Institute weekly inspections to ensure

facilities are maintained in good condition.

- Divert clean runoff and install infiltrating catch basins around boat launches to prevent pollutants from washing down the ramp and entering the lake.
- Provide public rest rooms and pumpout facilities to eliminate the potential discharge of wastewater to waterbodies.

Laws and Regulations

RSA 482-A and the administrative rules of the Wetlands Bureau (**Env-Wt 100-800**) regulate the construction of docks and marinas. Piers, floats, tie-off piles, and mooring buoys in navigable waters of the U.S. typically fall under the State Programmatic General Permit process, which is a cooperative program with the U.S. Army Corps of Engineers.

Moorings are regulated by the Department of Safety under authority of **RSA 270** and administrative rules **Saf-C 400-413**.

RSA 487:2 prohibits the operation of boats constructed to discharge wastewater upon waters of the State.

RSA 485-A:55, 56 prohibits the sale of detergents, except dishwasher detergents, that contain more than a trace amount of phosphorus.

The Clean Vessel Act was passed by Congress in 1992 and reauthorized in 1998 to help reduce pollution from vessel sewage discharges. The Act established a five-year federal grant program administered by the U.S. Fish and Wildlife Service. All recreational vessels must have access to pumpouts under the Clean Vessel Act. Funds are provided to states for the construction, renovation, operation, and maintenance of pumpout stations for pumping waste out of recreational boat holding tanks and dump stations for emptying portable toilets. For a directory of New Hampshire boat pumpout locations and information about boat pumpout service see www.des.nh.gov/wmb/cva.

All state laws in New Hampshire can be searched online at gencourt.state.nh.us/rsa/html/indexes/default.html

See BMP Resources on page 42

There are approximately 2,900 commercial and small-scale farms and 100–110 golf courses in New Hampshire, according to the 1997 USDA Census of Agriculture and the N.H. Golf Association. In addition, there are countless backyard hobby farms throughout the state. Farming depends on maintain-

ing the productivity of the land, yet its activities can also contribute nonpoint source pollution. Golf courses generally require intensive turf management, which often means chemical applications. The three primary nonpoint source concerns from agricultural and golf course land use activities are soil

loss or sedimentation, nutrients, and pesticides.

Runoff from bare fields can pick up soil particles, causing erosion of the land and sedimentation of waterbodies. Excessive irrigation on managed turf can sometimes result in deep percolation and runoff. Soil particles suspended in surface water



reduce the amount of sunlight available to aquatic plants; impair the gills of fish, shellfish, and aquatic insects; and diminish the in-stream habitat for aquatic organisms. Soil particles not only affect stream or lake sediment loads, but can also introduce pollutants to the system, because pollutants attach to the particles.

Runoff from fertilized fields and golf courses can cause algal blooms and related problems by introducing unnatural concentrations of nitrogen and phosphorus to an aquatic ecosystem. Nutrient runoff can increase the productivity of aquatic plants that will eventually die and decay. The bacteria decomposing the dead organic matter can deplete the oxygen supply in the water and cause unpleasant odors for recreational users of lakes and streams. Runoff from manure is also a source of bacteria, which can adversely affect human health.

Pesticides, fungicides, and herbicides applied to farmlands, lawns, and golf courses can also degrade water resources. Exposure to certain chemicals can cause poisoning to people and wildlife, through direct exposure and drinking water.

BMPs for Agriculture and Golf Courses

Although the activities are different, the basic goals of BMPs for agriculture and golf courses are very similar. They are as follows:

- Reduce the off-site transport of sediment, nutrients, and pesticides.
- Control the rate, method, and type of nutrients and chemicals being applied.
- Reduce the total chemical loads by use of integrated pest management (IPM), economic thresholds, alternative pest control, and soil testing.

Several BMPs for agriculture and golf courses are listed below by pollution source. Many of these can also be applied to home use. For new golf courses, several problems can be avoided if the designer fits the course to the existing terrain as much as possible, and takes into consideration waterbodies, wetlands, and steep slopes at the site. Most of these BMPs are applicable to agriculture. The BMPs that are also applicable to golf courses are marked with the symbol ▲.

Managing sedimentation

- Minimize tillage when farming and minimize extensive earth-moving when designing a golf course. ▲
- Plant a cover crop and/or allow crop residue to remain on the soil after harvest.
- Plant vegetative filter strips along surface waters and between fields and fairways.▲

- Protect the soil with rotational grazing.
- Rotate crops that provide limited ground cover with those that provide generous ground cover.
- Plant crops along contour lines when possible.
- Construct and stabilize diversions to control runoff across cropland and gully erosion. ▲
- Reduce erosion and sedimentation by barring access by livestock on bare streambanks.

Managing nutrients effectively

- Monitor the level of nutrients in soils by regular soil testing. ▲
- Divert, collect, or store runoff water from buildings and yards. ▲
- Install a vegetative filter along surface waters, feedlots, and edges of fields. ▲
- Avoid spreading manure or fertilizer during winter. ▲
- Incorporate manure into soil as soon as possible after spreading to minimize runoff during rainstorms.
- Prevent or control livestock access to waterbodies and implement “pasture pumps” or other watering systems next to heavy use areas and feed bunks.
- Diversify crop rotations and plant cover crops after harvesting that use residual nutrients.
- Determine manure application rates and timing according to nutrient needs of the crop.
- Set realistic yield goals.

Reducing pesticide use

- Apply pesticides only when needed. ▲
- Use insect-resistant crop or turf varieties. ▲
- Spot-treat insect infestations when possible. ▲
- Conserve beneficial insects.▲
- Select the least-toxic pesticide and use organic pesticides. ▲
- Observe setback zones. ▲
- Store, handle, and dispose of chemicals safely, according to state and federal regulations. ▲
- Manage crops to compete aggressively with weeds.
- Control weeds with cover crops.
- Use crop rotation and plant diversity to control insects.
- Plant pest-repelling plants next to crop plants (e.g., marigolds next to tomatoes).
- Contact the N.H. Department of Agriculture or your local county Cooperative Extension office (listed in the phone book) for assistance or advice on IPM programs, which use biological and nonchemical controls to reduce pesticide use. ▲

Laws and Regulations

The N.H. Department of Agriculture Division of Pesticide Control enforces state pesticide laws affecting sale, storage, and application of all registered pesticides. The N.H. Pesticides Controls law, **RSA 430:28-48**, requires pesticide applicators to obtain permits from or to be licensed by the Division of Pesticides Control

prior to application. Pesticides must be registered with the state, and applicators must submit reports of pesticide usage annually. Commercial applicators are also required to pass an exam that covers label protocol, chemical safety, environmental consequences, pest types, and use of application equipment. See rules **Pes 100-1000** (www.state.nh.us/agric/pecorl.html) for more information on certification, storage of pesticides, application, and setbacks from water resources.

The Comprehensive Shoreland Protection Act stipulates that no fertilizer, except limestone, shall be used within 25 feet of the high water line of a waterbody. See www.des.nh.gov/cspa/483B.htm.

The Manure, Agricultural Compost, and Chemical Fertilizer Handling Law, **RSA 431:33-35**, required the N.H. Department of Agriculture, Markets, and Food to develop BMPs for handling these materials and to investigate complaints of mismanagement. If the investigation finds that BMPs are not used, the department will notify operators in writing and require them to submit plans for compliance if the corrections are not made within 10 days.

The federal National Pollutant Discharge Elimination System (NPDES) program requires concentrated animal feeding operations (CAFOs) to obtain discharge permits. Large CAFOs are determined by the number of animals on the site, and the

Nutrient Runoff and Land Use

Which type of land use has higher amounts of nutrients in runoff – agricultural land or developed (urban, suburban, industrial, and commercial)? You might think agriculture, given the application of manure and fertilizers. But modeling studies in the Chesapeake Bay watershed and the Lake Champlain basin have shown that runoff from developed areas can produce just as much, or up to three times more, phosphorus and nitrogen per acre of land. Maintaining farmland in your community may be better for water quality than developing land! For information on incorporating agriculture into land use planning, see the technical bulletin *Preserving Rural Character: The Agricultural Connection*. Available online at www.state.nh.us/osp/planning/guide/docs/Tech Bulletin6.pdf)

threshold is specific to the type of animal. Medium CAFOs are determined by the number of animals and whether or not the facility discharges to surface water. Small facilities can be designated as CAFOs at the discretion of the permitting authority (EPA). For more information on the CAFO final rule, see EPA's website at http://cfpub.epa.gov/npdes/home.cfm?program_id=7.

All state laws in New Hampshire can be searched online at gencourt.state.nh.us/rsa/html/indexes/default.html

Every timber harvesting operation involves some risk of soil erosion that may affect water quality. EPA's 1996 National Water Quality Inventory estimated that forestry activities contributed approximately 9 percent of water quality problems in surveyed rivers and streams nationwide. Sediment, nutrients, and pesticides are pollutants commonly associated with forestry activities.

Road construction and road use account for 90 percent of the total sediment runoff from forestry operations. If erosion control mechanisms are not properly constructed and maintained on skid roads, haul roads, and landings, sediment may contribute to filling wetlands and stream channels. Sediment will add nutrients to lakes and ponds, interfere with fish respiration and filter feeders, and decrease aesthetic value.

Harvesting trees along a stream can also reduce streambank shading that regulates water temperature (and oxygen levels) for cold water fish. Removing vegetation destabilizes streambanks, and resulting sedimentation can limit sources of food, shade, and shelter for aquatic life and force them to move to another area.

When trees and other stabilizing vegetation are removed from a watershed, nutrients and other chemicals released from the soil into surface and groundwaters can cause water quality changes. Research in the White Mountain National Forest showed that

nitrate concentrations in stream water greatly increased during the four years after commercial clear cuts. In addition, soils are considered to be a "sink" for trace levels of mercury deposited from the atmosphere. Logging operations that greatly increase soil erosion may add small, but ecologically significant, amounts of mercury into the aquatic ecosystem.

Studies at Hubbard Brook Experimental Forest in Woodstock, N.H. have indicated that the critical determinants for levels of erosion and sedimentation from harvested sites is related to the care taken during harvesting and implementation of BMPs. Sediment yields may increase during logging operations regardless of the practices used, but effects on stream turbidity can be minimized when proper care is taken.

BMPs for Timber Harvesting

The goal of timber harvesting BMPs is to keep runoff away from exposed soils. This is accomplished by making proper road ditches and culverts, and constructing water bars and dips. In addition, filter strips between exposed soils and waterbodies must be maintained and water crossings must be constructed and maintained to prevent erosion. The following list includes major BMPs related to forestry practices.

- Survey the site to identify areas that might need special protection or management during forestry operations.
- Road systems should be designed to minimize road length, road width, and the number of places where water bodies are crossed.



- Erosion control devices and proper stream crossing design should be incorporated into site plans.
- Carefully select equipment and methods for transporting logs from the harvest area to the areas where logs are gathered to reduce the amount of disturbed soil.
- Operations should be timed to avoid rainy seasons and fish migration and spawning seasons.
- Streamside management areas, also known as buffer strips, should be used to protect against soil disturbance near stream banks.
- In areas where soils have been severely disturbed, revegetation efforts should occur as soon as possible.

Laws and Regulations

Forestry laws in New Hampshire are available online at www.nhdf.org/laws_rules/forestrylaws.htm.

RSA 227-J:5, Notice of Intent to Cut and Report of Wood Cut, states pursuant to **RSA 79**, an owner conducting a cutting operation shall file a notice of intent to cut and a report of wood cut as outlined in RSA 79.

RSA 227-J:6, Operations in Wetlands, states pursuant to **RSA 482-A**, no person shall excavate, remove, fill, dredge, or construct any structures in or on any bank, flat, marsh, or swamp in and adjacent to any waters of the state without a permit from DES. Permitted skid trails, truck roads and culverts, bridges, pole fords, or other crossings on the

skid trails or truck roads shall be constructed in accordance with procedures as currently cited in the *Best Management Practices for Erosion Control on Timber Harvesting Operations in New Hampshire*, published by the Department of Resources and Economic Development, Division of Forests and Lands.

RSA 227-J:7, Alteration of Terrain, states pursuant to **RSA 485-A:17**, any person proposing to transport forest products or undertake construction in or on the border of the surface waters of the state, and any person proposing to significantly alter the characteristics of the terrain, in such a manner as to impede the natural runoff or create an unnatural runoff shall comply with the provisions of **RSA 485-A**. The permits are obtained by completing the intent to cut form (**RSA 485-A:17 III**).

RSA 227-J:9, Cutting of Timber Near Certain Waters and Public Highways of the State, states that within a 12-month period, no more than 50 percent of the basal area of trees shall be cut or otherwise felled, leaving a well distributed stand of healthy, growing trees:

- a Within 150 feet of:
 - 1 Any great pond;
 - 2 Any standing body of water 10 acres or more in area;
 - 3 Any fourth order or higher stream; or
 - 4 Any public highway; or



b Within 50 feet of:

- 1 Any stream, river, or brook not included in subparagraph (a)(3) which normally flows throughout the year; or
- 2 Any standing body of water less than 10 acres in area associated with a stream, river, or brook which normally flows throughout the year.

The Comprehensive Shoreline Protection Act, **RSA 483-B**, states that if forest management is associated with shoreline development or land conversion, not more than 50 percent of the basal area of trees and a maximum of 50 percent of the total number of saplings can be removed for any purpose in a 20-year period. If forest management is *not* associated with shoreland development nor land conversion, and is conducted in compliance with RSA 227-J:9 (described above), it is exempt from RSA 483-B.

RSA 227-J:10, Care of Slash and Mill Residue, describes how far away slash and mill residue can be disposed of in relation to surface waterbodies.

All state laws in New Hampshire can be searched online at gencourt.state.nh.us/rsa/html/indexes/default.html

Adverse impacts on water quality, soil erosion, and aesthetics are concerns associated with the operation, maintenance, and closure of sand and gravel pits. Gravel excavation is often the first step in residential or commercial development. Water quality problems associated with mineral extraction are primarily related to sedimentation, but gravel pits can affect both surface water and ground water quality. Many pits are located over aquifers, and groundwater impacts can affect current or future sources of drinking water.

Typical water quality contaminants from gravel excavation are sediment, nutrients, petroleum products, and waste materials generated by pit operations. Sedimentation occurs from bare excavated slopes, where there is the potential for large quantities of materials, especially fine soil particles, to erode. Bare surface soils are also subject to wind erosion. Changes to drainage patterns can also cause erosion if adequate safeguards are not in place. Erosion can occur when a pit is active or after it has been closed if it was not properly revegetated. In addition, many communities require topsoil from mined areas to be stored on site, and most operators stockpile topsoil on site for site revegetation and closure.

The nutrients that adhere to soil particles are released to aquatic systems when eroded sediments are deposited into streams. The

other two contaminants, waste materials and petroleum products, can cause surface water and ground water quality problems if they are not properly disposed.

BMPs for Sand and Gravel Operations

- Allow space for gradual slopes, diversions, and adjacent owner protection.
- Cut and fill slopes should not exceed 2:1 (2 horizontal feet for 1 vertical foot) to provide stability. Flatter slopes (3:1) are preferred to facilitate seeding efforts.
- Maintain an adequate depth of unexcavated material above the seasonal high water table to act as a filter.
- Maintain buffer strips of natural vegetation between the pit and surface water, wetlands, public roads, and property lines.
- Construct diversions at tops of slopes to divert runoff water away from the slope banks to a stable outlet.
- Spread a minimum depth of 4 inches of topsoil over the site in order to revegetate the site.
- Assess the impact of the excavation on nearby drinking water wells, especially if groundwater or surface water is to be withdrawn from the pit area.
- Store petroleum products outside the pit area.
- Provide an above-ground containment area that can fully contain any spill if petroleum storage is essential in the pit.
- Dispose of any contaminated soils according to DES requirements in **Env-Wm 2603** and **Env-Ws 412** (see www.des.nh.gov/rules/swrules.pdf and www.des.nh.gov/orcb/412.htm).
- Maintain and wash equipment outside of pit area.
- Control dust as necessary to prevent nuisance and public hazard.
- Minimize areas designated for traffic.
- Use retention basins to trap fine material. Clean out as necessary.
- Use “anti-tracking” pads at gravel pit access roads. These are stone pads where mud can be dislodged from vehicle tires.

Laws and Regulations

RSA 485-A:17 states that all sand and gravel pits that will disturb more than 100,000 square feet of contiguous area (or 50,000 square feet within an area protected by the Comprehensive Shoreland Protection Act) must obtain a permit from DES prior to starting operation. This permit is commonly referred to as an “Alteration of Terrain” or “Site Specific” permit. It is a technical permit designed to protect water

quality, and it does not address other impacts that might be of concern to local citizens, such as aesthetics, noise, and dust. Those issues are addressed at the local level, usually by the planning board under authority granted by RSA 155-E. There is no exemption for highway construction with this permit as there is with RSA 155-E. Permits are issued on the condition that no wetland areas shall be disturbed without a permit from the DES Wetland Bureau.

RSA 155-E requires local planning boards, boards of selectman, or zoning boards of adjustment (if so designated by town meeting) to regulate gravel excavations. The statute describes situations in which permits are required. Operational and reclamation standards are described in this law, and many of these relate to nonpoint source pollution issues. Operational standards include setbacks from water bodies, vegetational buffers along water bodies, maintenance of

natural drainage patterns, control of sedimentation, and storage requirements for fuels and other toxic materials (specified in **Env-Ws 421**). Reclamation standards, applicable to all excavation operations, include revegetation and soil amendments, slope stabilization, and restoration of natural drainage patterns. Communities may adopt additional standards and have enforcement authority.

Env-A 2800 is under Statutory Authority **RSA 125-C:4** and establishes standards for particulate matter emissions and visible emissions for sand and gravel sources. Sand and gravel facilities must not exceed a certain visible emission standard and must be equipped with a fugitive emission control system. Facilities must follow permit, fee, monitoring, and reporting requirements as stipulated in **Env-A 600, 700, 800, and 900**, respectively. For more information, see www.des.nh.gov/ard/ardrules.htm.

National Pollutant Discharge Elimination System (NPDES)

permits for stormwater discharges are required of active or inactive mining operations and stone processing facilities from which water drains in a channelized way, as opposed to bermed operations where water is contained on site and infiltrates into the ground. Municipally-owned pits are regulated under Phase II of NPDES. New Hampshire facilities need to file a Notice of Intent (NOI) to the EPA to be covered by the Multi-Sector General Permit (MSGP), as described in the *Federal Register* on October 30, 2000. Section J in the MSGP contains the requirements for sand and gravel pits and stone processing facilities. Permittees must prepare a pollution prevention plan and unless they have qualified for exemption of monitoring requirements, they must monitor total suspended solids and nitrogen concentrations (nitrate plus nitrite) for a specified length of time.

Fuels, heating oil, and industrial process chemicals and their wastes historically have been stored in underground tanks. Because some constituents of petroleum products and other chemicals are carcinogens and will readily contaminate groundwater, leaking tanks can cause extensive and expensive damage. Spills from above ground tanks also raise concerns about water

quality and public health. One gallon of gasoline can contaminate approximately 730,000 gallons of water. And while some constituents of gasoline are persistent in the environment, others vaporize readily and are toxic if inhaled. Many fuel products are also potentially explosive.

DES has regulated the installation, monitoring, and removal of most underground storage tanks

(USTs) since 1985. The UST rules apply to all nonresidential underground storage facilities with storage capacities of more than 110 gallons that contain motor fuels or hazardous chemicals and to all on-premise heating fuel tanks 1,100 gallons or larger at commercial and industrial facilities. Rules governing above ground tanks apply to nonresidential tanks of 660 gallons or

greater in size containing petroleum products and were adopted in 1997. Residential tanks of 10,000 gallons or smaller are excluded from regulation. The rules establish requirements for the regulation, design, installation, operation, maintenance, and monitoring of tanks.

After January 1, 2005, owners of on-premise heating oil tanks must also meet DES “Best Management Practices for the Installation or Upgrading of On-Premise-Use Heating Oil Tank Facilities.” On-premise-use facilities include heating oil tanks and piping located at single family homes, apartments, commercial buildings, and industrial facilities. Failure to achieve compliance by that date will prevent access to the state cleanup funds should an oil release occur. To assist owners in meeting this new requirement, **RSA 146-E** authorizes a grant program (up to \$1,000) for owners that demonstrate a financial need.

All regulated USTs and most of the Above Ground Storage Tanks that have been registered with the state have been GPS-located and can be plotted on Wellhead Protection Area overlays for planning purposes.

BMPs for Chemical and Petroleum Storage

- Maintain up-to-date material inventory, schedule routine cleanup operations, and train employees about good housekeeping practices.
- Conduct periodic visual inspections for leaks or conditions that would lead to discharges and for conditions



that could lead to direct contact of stormwater with raw materials, intermediate materials, and waste materials or products.

- Have a spill prevention and response plan that describes spill containment, diversion, isolation, and cleanup practices, and procedures for notifying appropriate authorities.
- Conduct transfer operations only on impervious surfaces that are adequately bermed to control spills. Secondary containment should be available for all above ground storage facilities. Funnels and drip pans should be used to prevent spills.
- Store containers on impervious surfaces, such as concrete or asphalt, in areas that will contain leaks.
- Cover outdoor containers to prevent precipitation from coming in contact with the tops of the containers.
- Do not store containers in areas with functional floor drains or manholes, unless secondary containment is provided.

Laws and Regulations

RSA 146-C and **Env-Wm 1401** regulate underground storage tanks. **RSA 146-A:11-c** and **Env-Wm 1402** govern above-ground tank regulations. Anyone with questions regarding above or underground tanks should contact the DES Oil Remediation and Compliance Bureau at (603) 271-3644.

Authority to regulate the management, transportation, and disposal of hazardous waste in New Hampshire is given to DES in **RSA 147-A**, the Hazardous Waste Management Act. Specific regulations governing hazardous waste are found in **Env-Wm 100-1000**. Anyone with questions regarding proper hazardous waste management should contact the DES Hazardous Waste Compliance Section at (603) 271-2942.

RSA 485-C, the Groundwater Protection Act, authorizes local entities to manage potential contamination sources in wellhead protection areas. DES has adopted BMP rules that apply to use, storage, handling, and disposal of regulated substances (potentially hazardous materials) in other than household quantities.

All state laws in New Hampshire can be searched online at gencourt.state.nh.us/rsa/html/indexes/default.html

HOUSEHOLD BMP RESOURCES

General

Connecticut River Joint Commissions. *A Homeowner's Guide to Non-point Source Water Pollution in the Connecticut River Valley*. 1994. Available online at www.crjc.org/pdffiles/homeguide.pdf or contact them at PO Box 1182, Charlestown, NH 03603 (603) 826-4800. This booklet offers useful hints for homeowners on managing runoff, caring for septic systems, conserving water, and dealing with yard waste, bugs, and chemicals. It also offers alternatives for toxic household products and a directory of sources of help.

USEPA Office of Water. *Pointer No. 10: Managing Nonpoint Source Pollution from Households*. EPA841-F-96-004J. Online at www.epa.gov/OWOW/NPS/facts/point10.htm.

USEPA. *Do's & Don'ts Around the Home*. This EPA article has text on household chemicals, landscaping and gardening, septic systems, water conservation, other areas where you can make a difference (e.g., cleaning up pet waste), and community action. Online at www.epa.gov/OWOW/NPS/dosdont.html.

Septic Systems

DES Fact Sheets:

There are 12 DES fact sheets related to septic systems. They are available on the web at www.des.nh.gov/sub.htm and www.des.nh.gov/factsheets/bb/bb-11.htm or call (603) 271-2975. The latter fact sheet explains how septic systems can impact water quality.

DES. *You and Your Septic*, a brochure. Available if you call (603) 271-2975.

Chemical Use

DES Household Hazardous Waste Section. *Hazardous Materials in Your Home*. Online at www.des.nh.gov/pdf/hmiyhome.pdf or call (603) 271-2047.

The schedule for household hazardous waste collection days in New Hampshire is posted on the DES website at www.des.nh.gov/hhw/hhwevent.htm.

Lawn and Garden Activities

DES Fact Sheets:

Proper Lawn Care in the Protected Shoreland, The Comprehensive Shoreland Protection Act. SP-2 (1997). www.des.nh.gov/factsheets/sp/sp-2.htm

Municipal Composting of Yard Waste, DES Fact Sheet WMD-SW-3, 1998 www.des.nh.gov/factsheets/sw/sw-3.htm. Covers backyard composting, too.

DES. "Native and Naturalized Shoreland Plantings for New Hampshire."

An appendix in *Best Management Practices for New Hampshire Marinas: Guidelines for Environmentally Proactive Marinas*. (1995, revised in 2001) www.des.nh.gov/nhppp/marinas2.pdf.

Hillsborough County Conservation District and the USDA Natural Resources Conservation Service *Greenscaping (Reducing Pollution in Your Backyard)*. Chappell Professional Center, 468 Route 13 South, Milford, NH 03055 or call (603) 673-2409.

USEPA. *Healthy Lawn Healthy Environment: Caring for Your Lawn in an Environmentally Friendly Way*. Available through the NH Department of Agriculture, Markets & Food Division of Pesticide Control, (603) 271-3550 or it can be ordered for free by calling Irene Catcher, EPA Region 1, (617) 918-1525.

USDA Natural Resource Conservation Service. "Lawn and Garden Care" website. Information includes proper fertilizer use and alternatives to pesticides and chemicals by insect pests, www.nrcs.usda.gov/feature/highlights/homegarden/lawn.html

Center for Watershed Protection. "Toward a Low Input Lawn," article #130 in *The Practice of Watershed Protection*, 2000, editors Thomas R. Schueler and Heather K. Holland, Ellicott City, MD. Available online at www.stormwatercenter.net/ under "Publications" or from the Center for Watershed Protection, 8391 Main Street, Ellicott City, MD 21043, (410) 461-8323

Massachusetts Department of Food and Agriculture. *A Homeowner's Guide to Environmentally Sound Lawn Care: Maintaining A Healthy Lawn the IPM Way*. July 1997. Online at www.state.ma.us/dfa/pesticides/publications.

Massachusetts Department of Food and Agriculture. *Pesticide Storage and Handling Practices for Homes*. July 1997. Online at www.state.ma.us/dfa/pesticides/publications.

Impervious Runoff

DES Drinking Water Source Protection Program. *Managing Stormwater as a Valuable Resource: A Message for New Hampshire Municipalities and Water Suppliers*. DES-R-WD-01-13, September 2001. Online at www.des.nh.gov/dwspp/stormwater.pdf.

Pets

University of Wisconsin Cooperative Extension. *Pet Waste and Water Quality* fact sheet, GWQ006, DNR WT-534-99, R-11-99-10M-20-S. Online at [//clean-water.uwex.edu/pubs/sheets/index.html](http://clean-water.uwex.edu/pubs/sheets/index.html). Also available from Extension Publications, 630 W. Mifflin St., Madison, WI 53703 (608) 262-3346.

Pet waste poster at EPA's website: www.epa.gov/region01/eco/lis/posters/pet.html.

Air Pollution

DES Clean Cars Program and Energy Star Program. Online at www.des.nh.gov/ard/clean_cars.htm. For more information contact Kathy Brockett in the Air Resources Division at kbrockett@des.nh.gov or (603) 271-6284.

The Hubbard Brook Research Foundation. *Acid Rain Revisited: Advances in Scientific Understanding Since the Passage of the 1970 Clean Air Act Amendments*. Online at www.hbrook.sr.unh.edu/hbfound/hbfound.htm or contact the Foundation at 6 Sargent Place, Hanover, NH 03755, (603) 653-0390.

Peter M. Vitousek, Chair, John Aber, Robert W. Howarth, Gene E. Likens, Pamela A. Matson, David W. Schindler, William H. Schlesinger, and G. David Tilman. *Issues in Ecology – Human Alteration of the Global Nitrogen Cycle: Causes and Consequences*. Full report published in *Ecological Applications*, Volume 7, August 1997. Summary available online at <http://esa.sdsc.edu/tilman.htm>

SITE EXCAVATION AND ROAD CONSTRUCTION BMP RESOURCES

The DES Phase II website address for construction requirements is www.des.nh.gov/stormwater/construction.htm.

DES Fact Sheets:

Fees for Alteration of Terrain Permits. WD-WQE-2, 1997. Available online at www.des.nh.gov/factsheets/wqe/wqe-2.htm.

Alteration of Terrain Permits, When Are They Required? WD-WQE-3, 1997. Available online at www.des.nh.gov/factsheets/wqe/wqe-3.htm.

Soil Erosion and Sediment Control on Construction Sites. WD-WQE-6, 1996. Available online at www.des.nh.gov/factsheets/wqe/wqe-6.htm.

Impacts of Development on Stormwater Runoff. WD-WQE-7, 1996. Available online at www.des.nh.gov/factsheets/wqe/wqe-7.htm.

Federal Stormwater Permits. WD-WEB-8, 2002. Available online at www.des.nh.gov/factsheets/wwt/web-8.htm.

DES. *Best Management Practices for Urban Stormwater Runoff*. R-WSPCD-95-3, January 1996. Copies (\$5.00 each) can be ordered from DES by calling (603) 271-2975.

DES. *Best Management Practices for Construction Site Chemical Control*. 2000. NH Office of State Planning, DES, and NH Department of Agriculture, Markets, and Food. Available at DES.

DES and Rockingham County Conservation District. *Stormwater Management and Erosion and Sediment Control Handbook for Urban and Developing Areas in New Hampshire*. August 1992, revised edition expected in 2002.

DES and USDA Soil Conservation Service. *Soil Manual for Site Evaluations in New Hampshire*. 2d Edition, December 1991. Available through DES.

NHDOT Bureau of the Environment. *Best Management Practices for Routine Roadway Maintenance Activities in New Hampshire*. August 2001. Order copies from NHDOT Bureau of the Environment, 7 Hazen Drive, Concord NH 03301 (603) 271-3226. Available online at <http://webster.state.nh.us/dot/environment/pdf/BMPManual.pdf>.

NHDOT Bureau of Construction. *Guidelines for Erosion and Sediment Control and Stormwater Management*. Order from NHDOT Bureau of Construction, 7 Hazen Drive, Concord NH 03301. Available online at <http://webster.state.nh.us/dot/business.htm>.

UNH Technology Transfer Center. *Series of Quick Guides for New Hampshire Towns*. A set of pamphlets distributed as a set. The topics are 1) Culvert Installation and Maintenance, 2) Ditch/Channel Construction and Maintenance, 3) Vegetative Erosion & Sediment Control, 4) Non-Vegetative Erosion & Sediment Control, 5) Cut and Fill Slopes, 6) Beaver Pipe: Construction and Maintenance, 7) Stormwater Inlets and Catch Basins, 8) Mowing and Brush Control, 9) Snow and Ice Control, and 10) Obtaining Permits. Ordering information at www.t2.unh.edu/video_pub/publist.html.

EPA Office of Water. *Stormwater Management for Construction Activities – Developing Pollution Prevention Plans and Best Management Practices*. EPA 832-R-92-005, September 1992. Online at www.epa.gov/npdes/pubs/owm0307.pdf.

Information on erosion, sediment, and runoff control from roads, highways and unpaved roads available from the EPA online at www.epa.gov/owow/nps/roadshwys.html.

ROAD SALTING AND SNOW DUMPING BMP RESOURCES

DES Fact Sheets:

Snow Disposal Guidelines. WMB-3, 1992. Available online at www.des.nh.gov/factsheets/wmb/wmb-3.htm.

Road Salt and Water Quality. WMB-4, 1996. Available online at www.des.nh.gov/factsheets/wmb/wmb-4.htm.

UNH Technology Transfer Center. *Pros and Cons of Sand on Ice and Snowpack*. Fall 2001 newsletter, online at www.t2.unh.edu/fall01/pg6-7.html.

The following publications are available from UNH Technology Transfer Center, 33 College Road, Durham NH 03824. (603) 862-2826. They are listed at www.t2.unh.edu/video_pub/publist.html.

Calcium Chloride Package. A package of articles and pamphlets explaining the benefits of deicing with calcium chloride.

Deicing, Anti-Icing, and Chemical Alternatives. Informative sheet discusses the benefits of anti-icing, deicing, prewetting, and liquid chemical alternatives.

Road Salt and Water Quality. Environmental fact sheet discusses road salt management, alternatives to road salt, and the DOT Reduced Salt Pilot Program.

The Salt Storage Handbook. A practical guide for handling deicing salt. Published by the Salt Institute.

Series of Quick Guides for New Hampshire Towns. A set of pamphlets developed by the UNH Technology Transfer Center and distributed as a set. Topic #9 is Snow and Ice Control.

The Snowfighter's Handbook. A practical guide for snow and ice control before, during, and after a storm. Published by the Salt Institute.

Winter Operations Snow Removal and Ice Control Policy. From NHDOT, describes general policies, maintenance techniques, and equipment for snow and ice management.

USEPA. *Minimizing Effects from Highway Deicing*. Storm Water Management Fact Sheet, EPA 832-F-99-016, September 1999. Available online at www.epa.gov/owmitnet/mtb/ice.pdf.

Center for Watershed Protection. *Influence of Snowmelt Dynamics on Stormwater Runoff Quality*. Gary L. Oberts, Metropolitan Council, St. Paul, MN. Article #3 in *The Practice of Watershed Protection*, 2000, Thomas R. Shueler and Heather K. Holland, eds. Ellicott City, MD. Available online at www.stormwatercenter.net/ under “Publications” or from the Center for Watershed Protection, 8391 Main Street, Ellicott City, MD 21043, (410) 461-8323.

Environment Canada. *Assessment Report – Road Salts*. www.ec.gc.ca/substances/ese/eng/psap/final/roadsalts.cfm.

MOTOR VEHICLE SALVAGE AND STORAGE FACILITIES BMP RESOURCES

DES Fact Sheets:

Management of Used Motor Vehicle Batteries. WMD-SW-4, 1999.

Available online at www.des.nh.gov/factsheets/sw/sw-4.htm.

Reducing your Hazardous Wastes: An Overview for Businesses. WMD-HW-8, 1998.

Available online at www.des.nh.gov/factsheets/hw/hw-8.htm.

Scrap Metal Management. WMD-SW-19, 1998. Available online at

www.des.nh.gov/factsheets/sw/sw-19.htm.

Waste Antifreeze: Management Requirements for Handlers and Transporters.

WMD-HW-4, 1999. Available online at www.des.nh.gov/factsheets/hw/hw-4.htm.

Mercury-Containing (Universal Waste) Devices: Management Requirements for Handlers and Transporters. WMD-HW-17, 2002. Available online at

www.des.nh.gov/factsheets/hw/hw-17.htm.

Contaminated Cloth Wipes for Laundering. WMD-HW-6, 1998.

Available online at www.des.nh.gov/factsheets/hw/hw-6.htm.

Scrap Tire Management. WMD-SW-22, 2000. Available online at

www.des.nh.gov/factsheets/sw/sw-22.htm.

“Universal Waste” Batteries: Management Requirements for Handlers and

Transporters. WMD-HW-18, 2002. Available online at www.des.nh.gov/factsheets/hw/hw-18.htm.

DES. *NH Green Yards Environmental Guidance Manual for Motor Vehicle*

Recycling Yards. February 2003. Contact Pamela Sprague at nhgreenyards@des.nh.gov to order a copy.

DES. *Summary Requirements for Management of Used Oil Being Recycled*

(as provided in New Hampshire’s Hazardous Waste Rules

Env-Ws 100-1000). www.des.nh.gov/hwcs/requirements.pdf

DES Pollution Prevention Program. *Pitstops Manual: Best Management*

Practices for Automobile Service Facilities. R-WMB-01-3, undated.

Available online at www.des.nh.gov/nhPPP/pitstops.pdf.

The DES Pollution Prevention Program provides non-regulatory waste reduction assistance for businesses, maintains an in-house pollution prevention technology library, and serves as a clearinghouse for researching pollution reduction information. Call (603) 271-2900 or (800) 273-9469.

The New Hampshire Small Business Assistance Program provides free, confidential technical assistance to help small businesses with environmental compliance issues. Call (603) 271-1379 or (800) 837-0656.

WasteCap Resource Conservation Network (ReCoN) is a program operated by the Business and Industry Association of NH. It provides on-site solid waste reduction assistance and information for businesses. Call (603) 271-4676 or see their website at www.wastecapnh.org.

NH Hazardous Waste Assistance Hotline is at (603) 271-2942.

The DES Waste Management Division has received a grant to produce a BMP guidance document on MVSFs by the end of 2002. Until then, a good resource is available from the state of Minnesota, *but readers should be aware that certain wastes are regulated differently in MN than NH*. The Minnesota Pollution Control Agency has produced a "Motor Vehicle Salvage Facility Environmental Compliance Manual." A 15-minute videotape, "Salvage Yards and the Environment: the next generation" accompanies this publication. 2nd edition, 1998. Minnesota Pollution Control Agency, Ground Water and Solid Waste Division, St. Paul, MN.

Pollution Prevention and Remediation Programs Division, Fort Lauderdale, FL. *Pollution Prevention and Best Management Practices for Automobile and Other Salvage Facilities*. Available online at www.broward.org/ppi02300.htm. This is geared towards businesses in Broward County, Florida, but contains useful general information.

MARINA BMP RESOURCES

DES Fact Sheets:

Equipping Your Boat with a Marine Sanitation Device (MSD). WMB-2, 1996. Available online at www.des.nh.gov/factsheets/wmb/wmb-2.htm.

The DES Boat Inspection Program: Keeping Sewage and Greywater Out of New Hampshire Lakes. BB-38, 1997. Available online at www.des.nh.gov/factsheets/bb/bb-38.htm.

Pressure-Treated Wood: Can It Be Used in New Hampshire's Waters? BB-19, 2001. Available online at www.des.nh.gov/factsheets/bb/bb-19.htm.

Pamphlets available from DES Watershed Management Bureau:

A Boater's Guide to Cleaner Water

A Boater's Guide to Sewage Pumpout, www.des.nh.gov/pumpout.htm

Attention Boaters: Are you an Exotic Aquatic Weed Carrier?

Help Keep Our Coastal Waters Clean!

Keep Our Water Clean - Use Pumpouts

DES Pollution Prevention Program. *Best Management Practices for NH Marinas*. R-WSPCD-95-6, October 1995, revised in December 2001. A hard-copy version of the updated 2001 manual can be obtained by calling (800) 273-9469, or e-mailing nhppp@des.nh.gov. More information is available at www.des.nh.gov/nhppp/marinas.htm.

- USEPA Office of Water. *National Management Measures to Control Nonpoint Source Pollution from Marinas and Recreational Boating*. 2000. Online at www.epa.gov/owow/nps/mmisp/index.html.
- USEPA. *Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters*. Chapter 5: Management Measures for Marinas and Recreational Boating. EPA-840-B-93-001c, January 1993. Online at www.epa.gov/OWOW/NPS/MMGI.
- USEPA. *Managing Nonpoint Source Pollution from Boating and Marinas*, Pointer No. 9. EPA841-F-96-004I, 1996. Online at www.epa.gov/owow/nps/facts/point9.htm.
- US Fish and Wildlife Service. Information on the Clean Vessel Act online at http://fa.r9.fws.gov/cva/cva_info.html. Grant information is available at <http://fa.r9.fws.gov/grants/grantinf.html> under “Aquatic Ecosystems.”
- Connecticut Department of Environmental Protection, Office of Long Island Sound Programs and Bureau of Water Management. *Best Management Practices for Coastal Marinas*. August 1992. Publication available from Connecticut Department of Environmental Protection, 79 Elm Street, Hartford, CT 06106-5127. TEL: (860) 424-3034, FAX: (860) 424-4054.
- Maine Department of Environmental Protection. *Best Management Practices for Marinas and Boatyards: Controlling Nonpoint Pollution in Maine*. December, 1995. This manual contains a discussion of common pollutants and their potential impacts in marina waters. BMPs are discussed and listed. The manual includes useful fact sheets, a model oil spill response plan, and operations and maintenance plan based on Rhode Island’s plan. Copies are available through the Maine DEP, Augusta, ME 04333 or call (207) 287-7688.

AGRICULTURE AND GOLF COURSES BMP RESOURCES

General Agriculture and Nutrients

- NH Department of Agriculture, Markets, and Food. *Manual of Best Management Practices for Agriculture in New Hampshire: Best Management Practices for the Handling of Agricultural Compost, Fertilizer, and Manure*. Revised August, 1998. Online at www.nh.nrcs.usda.gov/Public_Affairs/Publications.htm under “Best Management Practices.”
- NH Department of Agriculture, Markets, and Food. *Best Management Wetlands Practices for Agriculture*. July 1993, Amended September 1998.
- NH Department of Agriculture and others. *Good Neighbor Guide for Horse-Keeping: Manure Management*, brochure prepared by April 1990. Online at <http://ceinfo.unh.edu/aahr1050.pdf>.
- NH Horse Council. *Guidelines of Best Management Practices for Horsekeeping*. 2001. Brochure. Copies available at DES; call (603) 271-7889.
- UNH Cooperative Extension. *Best Management Guidelines for Vegetable, Small Fruit, and Tree Fruit Growers*. Nada A. Haddad, 1993. Available through the author at the UNH Cooperative Extension Rockingham County office in Brentwood (603) 679-5616.

USDA NRCS New Hampshire office has Conservation Practice Sheets listed at www.nh.nrcs.usda.gov/news/publications.html under “Conservation Practice Sheets” for Alley Cropping, Contour Buffer Strips, Cross Wind Trap Strips, Field Borders, Filter Strips, Grassed Waterway, Herbaceous Wind Barrier, Mulch Till Residue Management, No Till Residue Management, Riparian Forest Buffer, Vegetative Barriers, and Windbreak/Shelterbelt.

USEPA. *National Management Measures to Control Nonpoint Source Pollution from Agriculture*. Technical guidance and reference document to manage NPS pollution from agricultural activities.
www.epa.gov/owow/nps/agmm/index.html.

USEPA list that highlights some of the best agricultural BMP materials available for both professionals and the public:
www.epa.gov/owow/nps/bestnpsdocs.html#agriculture.

The Environmental Quality Incentives Program (EQIP) was reauthorized in the Farm Security and Rural Investment Act of 2002 to provide a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible national goals. EQIP offers financial and technical help to assist eligible participants install or implement structural and management practices on eligible agricultural land. For more information, see www.nrcs.usda.gov/programs/eqip.

Northeast Regional Agricultural Engineering Service, Cooperative Extension. *On Farm Composting Handbook*. June 1992. Available for \$20 at (603) 862-2346.

Golf Courses

USEPA golf and the environment bibliography online
www.epa.gov/OWOW/wetlands/partners/golfbib.html.

Center for Watershed Protection. “Minimizing the Impact of Golf Courses on Streams,” article #134 in *The Practice of Watershed Protection*, 2000, editors Thomas R. Schueler and Heather K. Holland, Ellicott City, MD. Available online at www.stormwatercenter.net/Library/Practice/134.pdf under “Publications” or from the Center for Watershed Protection, 8391 Main Street, Ellicott City, MD 21043, (410) 461-8323.

NJ Department of Environmental Protection, Division of Watershed Management. *Draft Guidance Manual: Best Management Practices for Golf Course Construction and Operation in New Jersey*. January, 2000.
www.state.nj.us/dep/watershedmgt/draft_golf_bmp_manual.htm.

Buffer Strips

Connecticut River Joint Commissions: Ten fact sheets on buffers available online at www.crtc.org/riparianbuffers.htm, including titles such as “Introduction to Riparian Buffers,” “Buffers for Agricultural Land,” and “Backyard Buffers.”

The USDA NRCS has a website devoted to information on buffers at www.nrcs.usda.gov/feature/buffers/BufrsPub.html

TIMBER HARVESTING BMP RESOURCES

DES Fact Sheet:

Timber Harvesting and Water Quality. WD-WQE-4, 1996. Available online at www.des.nh.gov/factsheets/wqe/wqe-4.htm.

NH Department of Resources and Economic Development. *Best Management Practices for Erosion Control on Timber Harvesting Operations in New Hampshire*. Division of Forests and Lands, January 2001. Available online at www.nhdf.org/info_plan_bureau/fi&p_waterqualitybmps.htm.

NH Timberland Owners Association. *Best Management Practices for Controlling Soil Erosion on Timber Harvesting Operations in New Hampshire, A Pocket Field Guide for Foresters, Landowners, and Loggers*. 1993. Contact them at 54 Portsmouth St., Concord NH 03301 (603) 224-9699.

Connecticut River Joint Commissions. *Forestland Buffers for the Connecticut River Watershed*, Fact Sheet No. 3. Available online at www.crjc.org/riparianbuffers.htm.

USEPA. *Managing Nonpoint Source Pollution from Forestry*, Pointer No. 8. EPA841-F-96-004H, 1996. Online at www.epa.gov/owow/nps/facts/point8.htm.

USEPA. *Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters*. Chapter 3: Management Measures for Forestry. EPA-840-B-93-001c, January 1993. Available online at www.epa.gov/OWOW/NPS/MMGI.

Database of weblinks for forestry BMPs. Listed by agency at www.stateforesters.org/reports/BMP/BMP_Library.html#Database.

Maine forestry BMPs at www.ume.maine.edu/~woodlot/bmp.htm.

Minnesota Forest Resources Council. *Sustaining Minnesota Forest Resources: Voluntary Site-Level Forest Management Guidelines for Landowners, Loggers and Resource Managers*. This guidebook was developed as a collaborative statewide effort involving forestry and water quality stakeholders. It provides a set of integrated guidelines that address a variety of impacts on forest and water resources. www.frc.state.mn.us/FMgdline/Guidebook.html or contact the MFRC at 2003 Upper Buford Circle, St. Paul, MN 55108 or (651) 603-0109.

Wisconsin Department of Natural Resources, Bureau of Forestry. *Wisconsin's Forestry BMPs for Water Quality: A Field Manual for Loggers, Landowners and Land Managers*. 1997. This field manual lists over 119 BMPs for forestry activities including road building, timber harvesting, prescribed burning, and the application of chemicals. To request a publication, call (608) 267-7494. Information online at www.dnr.state.wi.us/org/land/forestry/usesof/bmp/bmp.htm.

SAND AND GRAVEL EXCAVATION BMP RESOURCES

DES Fact Sheets:

State Alteration of Terrain Permit Requirements for Sand & Gravel Pits. WD-WQE-1, 1997. Available online at www.des.nh.gov/factsheets/wqe/wqe-1.htm.

Alteration of Terrain Permits (Site Specific) When Are They Required?
WD-WQE-3, 1997. Available online at www.des.nh.gov/factsheets/wqe/wqe-3.htm.

NH Office of State Planning, DES, and NH Department of Agriculture, Markets, and Food. *Best Management Practices for Construction Site Chemical Control*. 2000. Available at DES.

NH Office of State Planning. *RSA 155-E: Earth Excavations*. 1998.
A 20-minute video on gravel pit regulation. This video provides a basic understanding of RSA 155-E, the law governing earth excavations and covers the operational and reclamation standards and common questions and answers. Available for \$12 from the Municipal and Regional Planning Assistance section of OSP. For more information see www.state.nh.us/osp/publications/start.html or contact Chris Northrop at OSP, 57 Regional Drive, Concord, NH 03301 (603) 271-2155.

USDA NRCS NH Office. *Vegetating New Hampshire Sand and Gravel Pits*. Technical Note PM-NH-21, April 1991; Revised April 2000.
Provides recommendations for controlling erosion at sand and gravel pits. Online at www.nh.nrcs.usda.gov/news/publications.html listed under "Conservation Planning and Practices."

USDA NRCS NH Office. *Gravel Pit and Other Sandy and Droughty Site Renovation Trials and Experiences in New Hampshire*. Technical Note PM-NH-26, May 1991, Revised April 2000. Available online at www.nh.nrcs.usda.gov/news/publications.html listed as "Gravel Pit Renovation."

Southwest Regional Planning Commission. *The Law Governing Earth Excavations*. A manual about state statutes governing gravel pits and local regulatory options, including recommended procedures for addressing gravel pits locally, a model ordinance, application checklist, and sample application form. Contact the Southwest Regional Planning Commission at 20 Central Square, 2nd Floor, Keene, NH 03431, (603) 357-0557, www.swrpc.org/library/index.html.

CHEMICAL AND PETROLEUM STORAGE BMP RESOURCES

DES Fact Sheets:

Fact sheets related to hazardous wastes can be found at www.des.nh.gov/hw.htm.

Fact sheets related to oil can be found at www.des.nh.gov/oil.htm.

Consumer Tips for the Safe Management of Gasoline. CO-10, 1998. Available online at www.des.nh.gov/factsheets/co/co-10.htm.

MtBE in Drinking Water. WD-WSEB-3-19, 2000. Available online at www.des.nh.gov/factsheets/ws/ws-3-19.htm.

DES Storage Tank Facilities and Contaminated Sites Databases:
www.des.nh.gov/asp/onestop/des_menu.asp.

Other DES publications available from the DES Public Information Center by calling (603) 271-2975 or writing pip@des.nh.gov.

List of Underground Storage Tanks (USTs) - CD-ROM. \$30, No Code #.

List of Leaking Underground Storage Tank (LUST) Sites. \$25, No Code #.

List of All Contaminated Groundwater Sites. \$25, No Code #.

Case Studies and Evaluations of Remedial Technologies at Leaking Underground Storage Tank Sites in NH, R-WSPCD-95-5.

Summary Requirements for Management of Used Oil Being Recycled (as provided in New Hampshire's Hazardous Waste Rules Env-Ws 100-1000). Available online at www.des.nh.gov/hwcs/requirements.pdf.

NH Office of State Planning, DES, and NH Department of Agriculture, Markets, and Food. *Best Management Practices for Construction Site Chemical Control.* 2000. Available at DES; call (603) 271-2975.

USEPA. *Catalog of EPA Materials on Underground Storage Tanks.* EPA-510-B-00-001, January 2000. This updated, revised booklet provides an annotated list of UST materials and includes ordering information. Many of the informational leaflets, booklets, videos, and software items listed are designed to provide UST owners and operators with information to help them comply with the federal UST requirements. Available online at www.epa.gov/swerust1/pubs/index.htm.

Alameda Countywide Clean Water Program. *Automotive-Related Industries: Best Management Practices for Storm Water and Industrial Sanitary Sewer Pollution Control.* 1993, Hayward, CA. (510) 670-5543.



4 CITIZEN INVOLVEMENT AND WATERSHED PLANNING

The previous sections have described water resources as well as practices to prevent or control pollution from various sources. This section describes several ways in which citizens and town officials can become more involved in watershed management.

Watershed Organizations

Hundreds of citizens living on or near rivers or lakes in New Hampshire have been working to maintain or improve the distinct attributes of their watersheds. Many of these committed individuals have organized to form local watershed organizations or joined existing organizations already working within their local watershed. Some organizations perform regular water quality monitoring; others are organized to address a particular issue. Some rely completely on volunteers; others have paid staff. Any organization working to protect the health of a

watershed can be considered a watershed organization. A local conservation district or commission, river or lake advisory committee or association, regional planning commission, forester association, invasive plant species coalition, organic farmer association, conservation education center, or land trust are examples of what might be considered watershed organizations.

Watershed organizations can be formed through several different partnerships or on their own. The New Hampshire Rivers Management and Protection

Program offers a partnership between state government and local citizens through the formation of a local river management advisory committee for a state designated river. The Federal Wild and Scenic Rivers System offers a similar partnership between the federal government and local citizens for watershed and river advisory committees. The New Hampshire Lakes Association has assisted in the formation of many lake associations. Each organization plays an intricate role in protecting not only the water, but its shoreland and watershed as well.

Water Quality Monitoring

More than one thousand citizens participate in the monitoring of New Hampshire lakes, ponds, rivers, and estuaries. Volunteers play a vital role in collecting data to evaluate water quality throughout the state. Many collect samples and analyze the water for various indicators of pollution.

Monitors may spend a few hours a week or a few hours a

month measuring, collecting, analyzing, and observing water quality indicators. Sampling schedules are flexible with most organizations sampling monthly throughout the summer. Samples are delivered to the appropriate lab for analysis. The volunteer data are then compiled, and results and interpretations are sent back to the volunteer monitors in the

form of a report. Monitors can develop watershed management and protection plans according to the testing results and their established water quality goals. The data are also used in state water quality assessment reports and often lead to restoration and/or watershed protection efforts.

One special program in New Hampshire is designed to better

characterize the levels of mercury that are present in freshwater fish. Specimens from lakes throughout New Hampshire have been submitted by volunteers and analyzed for mercury through the DES Volunteer Lake Assessment Program (VLAP). For more information, contact the VLAP or the DES Limnology Center at (603) 271-3414.

Volunteer monitoring leads to local awareness of land use and human practices that may be detrimental to water quality. Pollution prevention through routine monitoring ultimately saves the community and the state the cost of expensive, after-the-fact remediation. Maintaining clean water and quality water resources benefits all of us.

Citizen volunteers perform a great service by watching over

our water resources. If you're interested in getting your feet wet, contact one of the many citizen monitoring programs listed below.

Water Quality Monitoring Programs

DES Volunteer Lake Assessment Program
29 Hazen Drive
Concord, NH 03301
(603) 271-2963
www.des.nh.gov/wmb/vlap

DES Volunteer River Assessment Program
29 Hazen Drive
Concord, NH 03301
(603) 271-2963
www.des.nh.gov/wmb/vrap.htm

UNH Cooperative Extension
Lay Lakes Monitoring Program
Water Resources

Pettee Hall, UNH
Durham, NH 03824
Contact Jeff Schloss at
(603) 862-3848 or
Bob Craycraft at (603) 862-3546.
<http://ceinfo.unh.edu/watvol.htm>

Great Bay Coast Watch
UNH Cooperative Extension/
Sea Grant, Kingman Farm
Durham, NH 03824-3512
(603) 749-1565
www.gbcbw.unh.edu

Merrimack River Watershed
Council, PO Box 1377
181 Canal Street
Lawrence, MA 01842
(978) 681-5777
www.merrimack.org

River Network
153 State Street
Montpelier, VT 05602
(802) 223-3840
www.rivernetwork.org

weeds

The DES Exotic Species Program coordinates activities associated with the control and management of exotic aquatic plants, as well as education and volunteer plant monitoring programs. Exotic aquatic plants, such as milfoil and fanwort, have been a problem in New Hampshire lakes and ponds since the mid-1960s. Many exotic plants grow without natural controls. They encroach into and replace the habitats of native plants, disrupting the natural food web. Variable milfoil, by far the most wide-spread exotic aquatic plant in New Hampshire, was first found in Moultonborough Bay in

Lake Winnepesaukee. As of March, 2002, it has invaded 48 other waterbodies in the state. Other problematic species in New Hampshire include fanwort, water chestnut, Eurasian milfoil, purple loosestrife, and common reed.

Preventing the introduction of nuisance exotics is the best solution to the problems they create. Once a lake has become infested, it is impossible to eradicate the problem even when mechanical and chemical treatments are used. Mechanical removal of weeds requires a New Hampshire wetlands permit. Chemical applications can be performed only by

licensed pesticide applicators. Use of chemicals for aquatic weed control by unlicensed individuals is illegal and endangers other aquatic life and public health. Funds for exotic weed control are available under the Exotic Weed Control Program administered by the DES Watershed Management Bureau's Biology section (603) 271-2248.

To minimize chances of spreading nuisance exotics, you can:

- Remove plant fragments from boats and trailers and dispose of the vegetation on land away from water (these plants make good garden fertilizer).

- Avoid boating through large patches of vegetation.
- Contact the DES Exotic Species Coordinator at (603) 271-2963 if you see milfoil, fanwort, or an unfamiliar looking weed.
- Volunteer for the DES Weed Watcher Program. Information about this program is available at www.des.nh.gov/wmb/exoticspecies. This site contains links to an exotic

plant distribution map, exotic species facts, plant pictures, information about management activities, recommended plant ID guides, and information about how to be a Weed Watcher.

Remember, native aquatic plants are important in the ecological balance of your lake or pond. Plants provide shade, food, fish and invertebrate habitat, and diversity in the aquatic environ-



ment. Native plant communities can sometimes discourage invasive plants from taking hold.

Watershed Management Plans

Protecting and restoring aquatic ecosystems using a watershed approach has become popular at the national, state, and local levels. This strategy is based on the premise that many water quality and ecosystem problems are best solved at the watershed level rather than at the individual water body or polluter level. The approach has four principal components:

- Problems are prioritized and targeted.
- There is a high level of stakeholder involvement.
- Integrated solutions are made possible by taking advantage of the expertise and authority of a wide variety of agencies and stakeholders.
- Success is typically measured through monitoring or other data gathering.

Below are descriptions of watershed management plans that have been developed in

New Hampshire. Each plan includes the issues and solutions involved in the watershed of the targeted river, lake, pond, bay, or gulf. For information on other watershed management plans, contact DES at (603) 271-7889 or the appropriate local watershed organization.

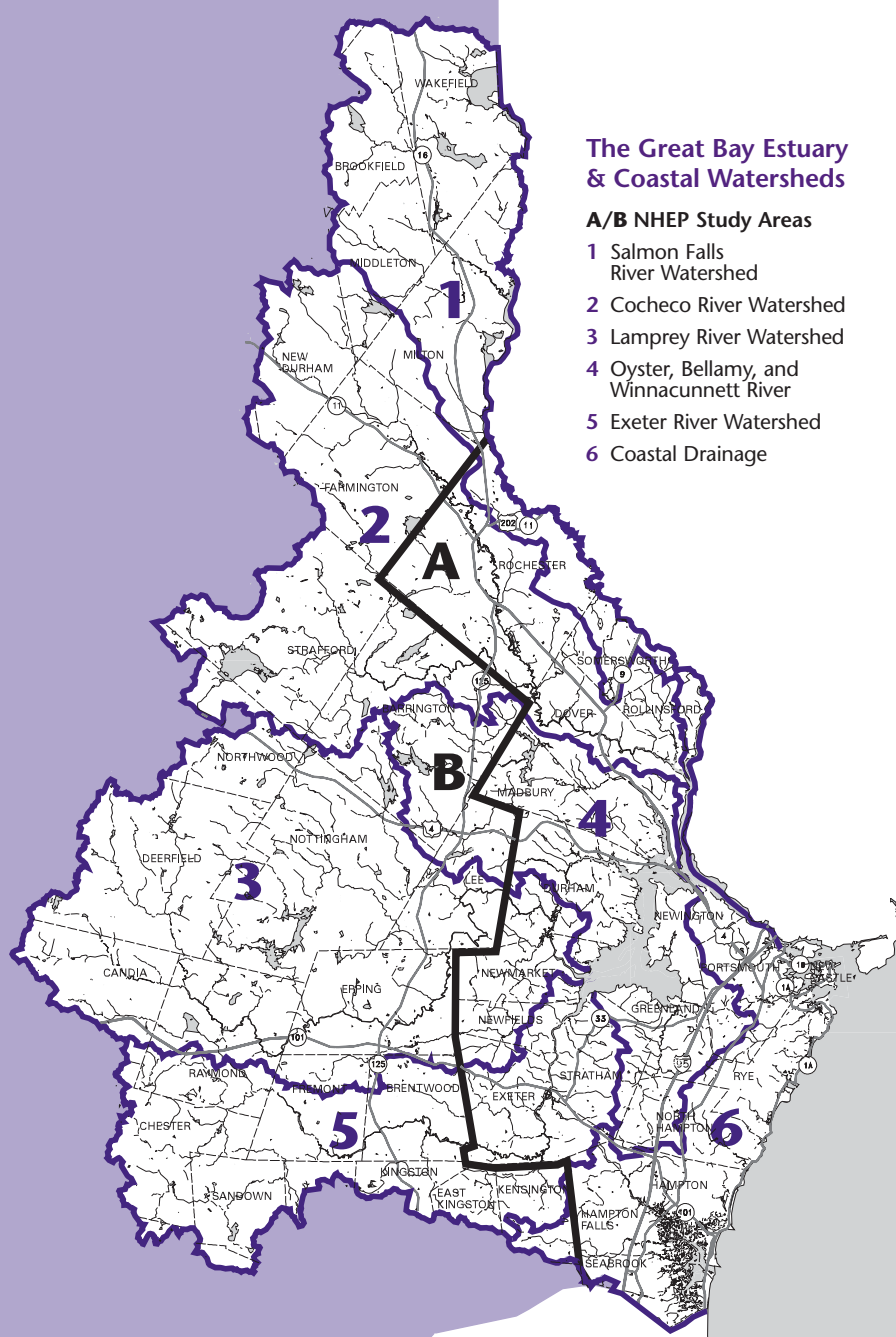
Squam Lake Watershed Plan

In 1984, the New Hampshire Council on Resources and Economic Development held several meetings in the Lakes Region to address the effects of rapid development around the area's lakes and to recommend a program of action to protect the lakes and surrounding lands. The Squam Lakes Watershed Plan, published in 1991 by the Squam Lake Watershed Advisory Committee, was the first such management plan to result from these meetings. Using a theme of "protection through managed use," the plan addressed land use,

water quality, protection of wildlife habitats, recreational use of the lakes, conservation of land, inter-municipal communication, and the role of education. The plan also recommends specific actions that should be undertaken by the State of New Hampshire, the five Squam-area municipalities, local organizations and groups, and local individuals.

The Upper Merrimack River Local Advisory Committee River Management and Implementation Plan

The Upper Merrimack River Local Advisory Committee (UMR LAC) was established in 1990 through the N.H. Rivers Management and Protection Program (**RSA 483**) to develop and facilitate the implementation of a river corridor management plan. The UMR LAC River Management and Implementation Plan was adopted in 1994 and is organized into three sections:



The Great Bay Estuary & Coastal Watersheds

A/B NHEP Study Areas

- 1 Salmon Falls River Watershed
- 2 Cocheco River Watershed
- 3 Lamprey River Watershed
- 4 Oyster, Bellamy, and Winnacunnett River
- 5 Exeter River Watershed
- 6 Coastal Drainage

New Hampshire Estuaries Project Management Plan

The New Hampshire Estuaries Project (NHEP) is part of the U.S. Environmental Protection Agency's National Estuary Program (NEP), which is a joint local/state/federal program established under the Clean Water Act with the goal of promoting the protection and enhancement of estuarine resources identified to be of national significance. The ultimate goal of each estuary project is to formulate and implement a realistic Management Plan. The Management Plan is available from the NHEP office at 159 Court Street, Suite 1, Portsmouth, NH or (603) 433-7187.

Berry's Brook Watershed Management Plan

The Berry's Brook watershed is 5.9 square miles in area, located mostly in Rye and Portsmouth, with smaller areas in Greenland and North Hampton. In June 1993, Appledore Engineering, Inc. produced the Berry's Brook Watershed Management Plan for the Berry's Brook Watershed Protection Council. The plan includes an inventory and analysis of watershed resources, potential threats to watershed resources, a watershed build-out analysis plan, and an action plan. The Management Plan includes goals and policies, regulatory strategies, and non-regulatory strategies. For more information contact: Jeff Gardner, Berry's Brook Watershed Protection Council, (603) 433-6189.

Water Resources Management, Riparian Lands Management, and Outstanding Resources Management. This plan is available online at www.merrimackriver.org/publications.htm.

With partnerships formed throughout the watershed, the UMR/LAC has initiated a number of other projects and programs such as the Upper Merrimack Monitoring Program (UMMP), which works with volunteers to conduct field chemistry, bacterial

sampling, and biomonitoring at eleven sites on the Pemigewasset, Winnepesaukee, Contoocook, and Merrimack Rivers from Franklin to Bow. The UMMP has published *Macroinvertebrates of the Upper Merrimack*, an annotated picture identification key, and *The State of the Upper Merrimack 1995-1997*, a river quality report incorporating the first three years of monitoring. The group also publishes a newsletter and hosts training workshops, lectures, and activities.

Education and outreach are integral parts of both watershed planning and encouraging citizen involvement. Gaining a better understanding of the role people have in affecting water quality can foster skills and motivation that lead to maintaining or improving that quality.

For any education to be effective, it must be well thought out and planned. The first step in starting an education or outreach program is identifying your outreach goals. The next step is to consider the message that you want people to understand. Who is your audience for the information or who needs it most? What does the audience already know?

What do they want to know? How can you get the audience motivated to care about your message? Where or how should the message be delivered?

There are many education and outreach programs and resources available to increase public awareness of nonpoint source issues. National, state, and local organizations provide a variety of education tools or you can create your own. A few examples include:

- School curricula can be designed around watershed and nonpoint issues.
- Speakers can present at schools, workshops, conferences, and meetings.

- Brochures and posters can be obtained through many organizations or create one with a special message.
- Displays can be tailored to the audience at a local event or school.
- Flyers are an easy way to deliver a quick message or to advertise an event.
- Press releases about a project or event provide a cost effective way to get information to a broad audience.
- Newsletters distributed by state and local organizations will often accept outside articles on projects or information.
- Websites are a valuable resource for getting out timely information or to refer people to for more information.
- Workshops, forums, conferences, and meetings provide continuing education on available resources, updates, data, issues, and thought provoking ideas from a local to a national level.
- Promotional items with an environmentally-friendly tone, such as recycled content products, native plantings, and organic cotton t-shirts, can get a message across while setting an example.

Many watershed-related organizations incorporate creative educational programs into their watershed management plans or grant applications.



Watershed Organization Resources

USEPA. Find out what watershed you live in and other information about watersheds in your state from EPA's *Surf Your Watershed* website at www.epa.gov/surf. There is also a commercial site that identifies local watersheds, at <http://mywatershed.com>. The site generates a map showing the rivers and watershed boundaries in your town.

USEPA Office of Water. *Watershed Protection: A Project Focus*. EPA 841-R-95-003, August 1995. Available online at www.epa.gov/owow/watershed/focus/index.html.

The Terrene Institute. *Organizing Lake Users: A Practical Guide*. Alexandria, VA, 1991. Visit www.terrene.org/; select "catalog," then "publications" for a list of the resources, or phone (703) 548-5473.

Water Quality Monitoring Programs Resources

Connecticut River Joint Commissions. *A Citizens' Guide to River Monitoring in the Connecticut River Valley*. 1995. Produced by the River Watch Network for the Connecticut River Joint Commissions with support from DES. The principles of organizing and carrying out a river monitoring program, as described in this document, apply to rivers everywhere, not just the Connecticut River Valley.

USEPA. The EPA website on volunteer monitoring is www.epa.gov/owow/monitoring/vol.html. The website includes general information as well as methods manuals for all types of water quality monitoring.

Education and Outreach Resources

For more information about education and outreach resources contact DES, Watershed Outreach Coordinator, (603) 271-2457 or bmcmillan@des.nh.gov. Additional resources include:

UNH Sea Grant New Hampshire, Kingman Farm, Durham, NH 03824, (603) 749-1565 or www.unh.edu/marine-education/index.html. Information on UNH Marine Docents Program and Sea Trek Educational Programs.

Amoskeag Fishways Learning and Visitors Center, Manchester, NH, (603) 626-FISH or www.amoskeagfishways.org. Family programs, visitor center, and exhibits.

USEPA. Office of Environmental Education: (202) 564-0443 or www.epa.gov/enviroed.

The Terrene Institute, 4 Herbert Street, Alexandria, VA, 22305. A not-for-profit, nonadvocacy organization, the Terrene Institute provides posters and books, conferences, and is a distributor of the EnviroScape® educational units. Visit www.terrene.org/ or phone (703) 548-5473.

Council of State Governments. *Getting in Step: A Guide to Effective Outreach in Your Watershed*, Ordering information available at UMI Books on Demand, PO Box 1346, Ann Arbor, MI 48106, (800) 521-0600 or www.bellhowell.infolearning.com (click on UMI, then Books on Demand).

Massachusetts Water Watch Partnership, University of Massachusetts (MassWWP) provides training and technical assistance to citizen organizations that conduct water quality monitoring programs on the lakes, rivers, and estuaries of Massachusetts. Contact them at (413) 545-5532 or visit their website at www.umass.edu/tei/mwwp. One useful publication that they offer is *Ready, Set, Present: A Data Presentation Manual for Volunteer Water Quality Monitoring Groups* Available online at www.umass.edu/tei/mwwp/datapresmanual.html.

Maine Department of Environmental Protection and Congress of Lake Associations. *A Citizen's Guide to Lake Watershed Surveys: How to Conduct a Nonpoint Source Phosphorus Survey*. Publication #DEPLW-41-A97, April 1997.

Funding assistance for watershed management is available from various government and private sources. This section provides an overview and contact information for financial assistance programs offered by the state of New Hampshire. The programs listed below provide funding annually. Information presented here is accurate at the time of publication and is subject to change, so please contact the appropriate agency to learn more about the programs.

Watershed Grants

Section 319 Watershed Assistance Grants

Funding organization: DES Watershed Assistance Section.

Approximate grant amount: \$300,000 distributed in grants annually, no limit on grant requests.

Who can apply: Statewide. Eligible applicants include non-profits, government units, conservation districts, regional planning commissions, and watershed organizations.

Types of projects funded: Watershed management plans, BMP implementation, education and outreach, and organization building to address nonpoint source pollution problems.

Grant cycle: The request for proposals (RFP) is issued in August. Proposals are due in November. Grants are awarded in January, with contract approval by April.

Match required: 40 percent of total project cost.

Contact: DES Watershed Assistance Section, 29 Hazen Drive, Concord, NH 03301. (603) 271-2457. See also www.des.nh.gov/wmb/was/grants.htm

Section 319 Watershed Restoration Grants

Funding organization: DES Watershed Assistance Section.

Approximate grant amount: \$500,000 distributed in grants annually.

Who can apply: Eligible applicants include non-profits, government units, conservation districts, regional planning commissions, and watershed organizations.

Types of projects funded: Restoration of water bodies that have been impaired by nonpoint source pollution.

Grant cycle: The RFP is issued in August. Proposals are due in November. Grants are awarded in January, with contract approval by April.

Match required: 40 percent of total project cost.

Contact: Coastal Watershed Supervisor: DES, 360 Corporate Drive, Portsmouth, NH 03801. (603) 433-0877. Merrimack Watershed Supervisor: DES, 29 Hazen Drive, Concord, NH 03301 (603) 271-2457. See also www.des.nh.gov/wmb/was/grants.htm.

Section 319

Small Outreach and Education Grant Program for Nonpoint Source Pollution

Funding organization: DES Watershed Assistance Section.

Approximate grant amount: \$20,000 distributed in grants annually.

Who can apply: Eligible applicants include non-profits, government units, conservation districts, and regional planning commissions.

Types of projects funded: Outreach or education projects to solve nonpoint source pollution problems including but not limited to: material development, public mailings, public events, website setup or design, displays, and demonstration or education sites.

Grant cycle: Grants will be advertised continuously with applications accepted quarterly.

Match required: 40 percent of total project cost.

Contact: Watershed Outreach Coordinator: DES, 29 Hazen Drive, Concord, NH 03301 (603) 271-7889. See also www.des.nh.gov/wmb/was/grants.htm.

Source Water Protection Grants

Funding organization: DES Drinking Water Source Protection Program.

Approximate grant amount: \$200,000 annually; individual grant limit of \$15,000.

Who can apply: Statewide. Water suppliers, municipalities, regional planning commissions, county conservation districts, and non-profit organizations are welcome to apply. Applicants must have endorsement of a public water supplier.

Types of projects funded: Delineation of protection areas, assessment/planning, inventory of threats to water supplies, and implementation of protection programs.

Grant cycle: The RFP is issued in August. Proposals are due in November. Grants are awarded in January.

Match required: No match required.

Contact: DES Source Water Protection Program, 29 Hazen Drive, Concord, NH 03301 (603) 271-7017. See also www.des.nh.gov/dwspp/grants.htm.

Water Supply Land Conservation Grant

Funding organization: DES Drinking Water Source Protection Program.

Approximate grant amount: \$300,000 annually.

Who can apply: Eligible applicants include any municipality (including villages and school districts) or non-profit organization having water supply as a principal mission.

Types of projects funded: The purchase of land or conservation easements critical to the protection of drinking water source protection.

Grant cycle: There are two cycles per year. In the fall, eligibility applications are due October 1 and final applications are due December 1. In the spring, eligibility applications are due February 1, and final applications are due April 1.

Match required: 75 percent match is required.

Contact: DES Drinking Water Source Protection Program, 29 Hazen Drive, Concord NH 03301 (603) 271-0688 or the Society for the Protection of NH Forests, 54 Portsmouth St., Concord NH 03301 (603) 224-9945. See also www.des.nh.gov/dwspp/ws_landgrant.htm.

Water Quality Planning Grants

Funding organization: DES Watershed Management Bureau.

Approximate grant amount: \$50,000 annually.

Who can apply: Eligible applicants include the nine regional planning commissions.

Types of projects funded: Projects that support local river advisory committees and watershed planning.

Grant cycle: Annual.

Match required: None.

Contact: DES Watershed Management Bureau, 29 Hazen Drive, Concord, NH 03301. (603) 271-2457. See also www.des.nh.gov/wmb/was/grants.htm.

Regional Environmental Planning Program

Funding organization: DES

Approximate grant amount: \$225,000 annually

Who can apply: Available only to the nine regional planning commissions.

Types of projects funded: Environmental planning projects, including watershed management.

Grant cycle: Annual.

Match required: None.

Contact: DES Watershed Assistance Section, 29 Hazen Drive, Concord, NH 03301. (603) 271-2457. See also www.des.nh.gov/wmb/was/grants.htm.

New Hampshire Coastal Program Competitive Grant Program (Financial Assistance Grants)

Funding organization: New Hampshire Coastal Program (Office of State Planning and Energy Programs).

Approximate grant amount: \$200,000 annually; individual grant limit of \$50,000.

Who can apply: Eligible applicants include municipalities, local community groups, environmental/watershed associations, nonprofit organizations, schools and educational institutions, county conservation districts, and regional planning commissions within the coastal watershed.

Types of projects funded: Waterfront access creation and enhancement, environmental remediation, pollution prevention, habitat inventories, land protection planning, waterfront park planning and improvement, and environmental research.

Grant cycle: The RFP is issued in October, proposals are due in the middle of January, grants are awarded in April/May, and contracts are approved by July 1. Projects must typically be done within 12 months.

Contact: NHCP, 152 Court St., Portsmouth, NH 03801 (603) 431-9366. See also www.state.nh.us/coastal/program/grants.htm.

Local Grants Program

Funding organization: New Hampshire Estuaries Project (Office of State Planning and Energy Programs)

Approximate grant amount: Approximately \$50,000 annually, individual grant limit of \$10,000.

Who can apply: Eligible applicants include municipalities, local community groups, environmental/watershed associations, nonprofit organizations, schools and educational institutions, county conservation districts, and regional planning commissions within the coastal watershed.

Types of projects funded: Projects that address actions listed in the NHEP Management Plan (2000).

Grant cycle: Grant cycle varies year-to-year. See the NHEP website for details: www.state.nh.us/nhep.

Match required: 50 percent of total project cost.

Contact: NHEP Director, 152 Court St., Suite 1, Portsmouth, NH 03801 (603) 433-7187.

Waste Reduction Grants

Household Hazardous Waste Collection Program

Funding organization: DES Waste Management Division.

Approximate grant amount: \$250,000 annually.

Who can apply: Eligible applicants include communities or groups of communities (regional planning commissions or solid waste districts).

Types of projects funded: Household hazardous waste collection. Highest priorities are given to new applicants and communities or groups with a population greater than 10,000.

Grant cycle: There are two funding rounds each year. Applications are due on November 15 and May 15.

Match required: 50 percent of total project costs.

Contact: DES Household Hazardous Waste Program, 29 Hazen Drive, Concord NH 03301 (603) 271-2047. See also www.des.nh.gov/hhw/hhwgrant.htm.

Used Oil Collection Grant Assistance Program

Funding organization: DES Waste Management Division.

Approximate grant amount: There is an individual grant limit per year of \$2,500 or \$5,000 for groups of municipalities.

Who can apply: Eligible applicants include municipalities and other political subdivisions, nonprofit waste management and recycling organizations, and state-registered motor vehicle inspection stations.

Types of projects funded: Projects that establish, improve, or operate used oil collection centers that serve individuals who change their own oil. Government entities can also use funds to transport used oil to an off-site recycling facility.

Grant cycle: There are six funding rounds each year. Applications are due by February 1, April 1, June 1, August 1, October 1, and December 1 each year, with approval 2 months after the submittal date.

Match required: No match required.

Contact: DES Used Oil Program, 29 Hazen Drive, Concord NH 03301. 1-888-TAKEOIL or (603) 271-6424. See also www.des.nh.gov/hwcs/used_oil.htm.

Agriculture Nutrient Management Grant Program

Funding organization: New Hampshire Department of Agriculture, Markets and Food, Bureau of Markets.

Approximate grant amount: \$75,000 annually, individual grant limit of \$2,500.

Who can apply: Eligible applicants include agricultural operators and organizations.

Types of projects funded: Livestock fencing, controlled wetland crossings, concrete pads for manure/compost storage, roofs for manure/compost storage, barn/gutter downspouts, pasture pumps and other watering systems, vegetative buffers or berms, and educational programs.

Grant cycle: There are two funding rounds each year. Applications deadlines are June 1 and December 1.

Match required: None.

Contact: NHDAMF, Bureau of Markets, PO Box 2042, Concord NH 03302 (603) 271-2753. See also www.agriculture.nh.gov.

Conservation License Plate Program

Funding organization: State Conservation Committee.

Approximate grant amount: \$150,000 annually.

Who can apply: Eligible applicants include county conservation districts, cooperative extension natural resource programs, conservation commissions, schools, scout troops, nonprofit groups, and conservation organizations.

Types of projects funded: Projects that enhance the environment by promoting the sustainability of the state's public and private land, air, water, and cultural resources to prevent their pollution or degradation. See also www.mooseplate.com.

Grant cycle: Applications are accepted in January.

Match required: No match required.

Contact: State Conservation Committee, 25 Capitol Street, P.O. Box 2042, Concord, NH 03302 (603) 679-2790.

For information on federal grants, see:

Catalog of Federal Funding Sources for Watershed Protection, second edition. USEPA, Office of Water, December, 1999.
EPA 841-B-99-003. Available online at www.epa.gov/OWOW/watershed/wacademy/fund.html.

For information on private foundations, see:

The Foundation Center, 79 Fifth Ave., New York, NY 10003 (212) 620-4230. This organization maintains a Foundation Directory, which is also online at <http://fdncenter.org>. There is a subscription fee to access the searchable directory, but the website offers free links to grantmaker websites at <http://fdncenter.org/funders/grantmaker/index.html>.



APPENDIX: CONTACTING AGENCIES IN THIS GUIDE

Agencies and Organizations Involved in Nonpoint Source Pollution Issues

Description	
NH General Court State House Concord, NH 03301 (603) 271-3680 http://gencourt.state.nh.us/rsa/html/indexes/default.html	All state laws can be searched online at the referenced website.
NH Department of Environmental Services (DES) 29 Hazen Drive Concord, NH 03301 (603) 271-3503 www.des.nh.gov/	Wetlands, groundwater protection, lakes and rivers, watershed management, biology, septic systems, household hazardous waste, shellfish, water quality, storage tanks, shoreland protection
NH Office of State Planning and Energy Programs and NH Coastal Program 57 Regional Drive Concord, NH 03301 (603) 271-2155 http://www.state.nh.us/osp/ www.state.nh.us/coastal/	Municipal planning, land use controls, coastal NPS program
NH Estuaries Project 159 Court Street, Suite 1 Portsmouth, NH 03801 (603) 433-7187 www.state.nh.us/nhep/	Water quality in NH's estuaries
NH Dept. of Agriculture, Markets, and Food 25 Capitol Street, P.O. Box 2042 Concord, NH 03301-2042 (603) 271-3551 www.state.nh.us/agric/aghome.html	Agricultural best management practices, pesticide use
NH Dept. of Resources and Economic Development Division of Forests and Lands 172 Pembroke Road Concord, NH 03301 (603) 271-2215 www.nhdf.org/	Logging and forestry
NH Dept. of Safety James H. Hayes Building 33 Hazen Drive Concord, NH 03301 (603) 293-0091 http://www.nh.gov/safety/	Moorings program, boating safety

NH Dept. of Transportation

John O. Morton Building
7 Hazen Drive
Concord, NH 03302-0483
(603) 271-3734
<http://webster.state.nh.us/dot/index.htm>

Stormwater, sediment control, road maintenance

US Environmental Protection Agency

Region I (New England)
1 Congress Street, Suite 1100
Boston, MA 02114-2023
inside New England: (888) 372-7341
outside New England: (617) 918-1111
www.epa.gov/
www.epa.gov/region01/

Nonpoint source pollution, wetlands, federal stormwater permits

USDA Natural Resources Conservation Service

Federal Building
2 Madbury Road
Durham, NH 03824-2043
(603) 868-7581
www.nrcs.usda.gov/
www.nh.nrcs.usda.gov/

Soils information, technical assistance for stormwater, agriculture, forestry, and natural resource issues

US Army Corps of Engineers

New England Division
696 Virginia Road
Concord, MA 01742-2751
(978) 318-8111
www.usace.army.mil/
www.nae.usace.army.mil/

Federal wetlands permits

UNH Cooperative Extension

University of New Hampshire
110 Pettee Hall
Durham, NH 03824
(603) 862-1029
<http://ceinfo.unh.edu/>

Water resources monitoring, education and outreach, forestry BMPs, GIS and GPS training, integrated pest management

UNH Technology Transfer Center

Kingsbury Hall
33 College Road
Durham, NH 03824-3591
(800) 423-0060 (inside NH)
or (603) 862-2826
www.t2.unh.edu/

Technical assistance for transportation issues

NH Association of Conservation Districts

PO Box 2042
Concord, NH 03302-2042
(603) 271-3551
(not on the web)

Natural resource issues, County
Conservation Districts

Rockingham County Conservation District

118 North Road
Brentwood, NH 03833-6614
(603) 679-2790
http://ceinfo.unh.edu/zip_check.htm

Stormwater manual

Nashua Regional Planning Commission

115 Main Street, P.O. Box 847
Nashua, NH 03061
(603) 883-0366
www.nashuarpc.org/

Regional planning agency, excavation
regulations, growth/sprawl study

North Country RC&D Area Council

107 Glessner Road
Bethlehem, NH 03574
(603) 444-6303
www.nccouncil.org/

Natural resource issues

NH Lakes Association

5 South State Street
Concord, NH 03301
(603) 226-0299
www.nhlakes.org/

Lake issues

NH Timberland Owners Association

54 Portsmouth Street
Concord, NH 03301
(603) 224-9699
www.nhtoa.org/

Forest management

Granite State Designers & Installers

76 South State Street
Concord, NH 03301
(603) 228-1231
www.gsdia.org/

Septic systems

WasteCap of New Hampshire

122 North Main Street
Concord, NH 03301
(603) 224-1517
www.wastecapnh.org/

Provides free and confidential assistance
to businesses to reduce waste, save
energy, and prevent pollution.

**NH Small Business Development Center
Environmental Assistance Program**

Rivier College, Sylvia Trottier Hall
20 Main Street
Nashua, NH 03060-2702
(603) 897-8484
www.nhsbdc.org/eap.htm

Assists businesses in reducing waste
and maximize profits



New Hampshire Department of Environmental Services
Water Division
29 Hazen Drive
Concord, NH 03301